THE

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ELECTRICAL REVIEW.

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THE VALUE OF A SENSE OF PROPORTION.

AN interesting exposition of modern conditions of warfare told in narrative form appeared some time ago, in which was given a picture of the general in command studying the grouping of the opposing forces by means of flags placed on a map of the war area. In response to an expression of horror from one of his subordinates on the receipt of news of a reverse at one portion of the firing line, the general exclaimed: "Proportion, gentlemen, proportion; it is not worth even moving a flag." Experience has amply shown the fact that in the actual progress of a fight the hardest thing of all to preserve is this sense of proportion, although it is one of the most important aids to victory. We well remember, during the progress of the Russo-Japanese war, reading that in one of the fiercest battles regiment after regiment, and battalion after battalion, flung themselves through the millet fields only to be beaten back again, for the purpose of securing a small eminence of almost insignificant value, simply because this was the only thing which could be seen above the waving heads of the millet, and so possessed a kind of magnetic attraction to the opposing forces.

It would be well if this great quality of the sense of proportion could be acquired and maintained, both individually and collectively, by the men who direct the operations of the great forces which we are wont to mass under the title of electrical engineering. In times past, strenuous conflicts have been waged over points which, in the light of cooler judgment and subsequent experience, have proved to be comparatively valueless and insignificant. A great deal of human strength and human brains, as well as vast sums of money, have been sacrificed, thanks to the lack of proportion. Obviously it would be invidious to particularise, but the giving of a few general cases may not be without advantage.

We all probably know some firm or another which, starting in a general way to manufacture articles in common request, has suddenly taken up a speciality and devoted its strength to the new venture. We are not attempting to discourage specialisation on rational lines, and with an adequate reserve to guard against the heavy contingencies which always are associated with specialisation, we believe that success may be reaped, but it is at the risk of putting all one's eggs in one basket. The particular invention or adaptation may be thoroughly sound and satisfactory; it may even for a time obtain a ready sale, but it is not safe to build on this. Sooner or later an improvement is sure to arise; sooner or later a modification in some other industry using the special apparatus may develop, and with it the security of the venture vanishes. In the meantime, the firm manufacturing this speciality has lost its sense of proportion; it thinks this particular production is a gold mine and that there is nothing else to touch it; it does not provide for con-

tingencies either by putting plenty of money to reserve or by keeping up its general manufacturing lines, with the result that in many cases disaster follows.

Let us take for another example the case of a man who has received a general training and becomes an efficient man of the type which would in the medical fraternity be referred to as a "good general practitioner." This man very often by a stroke of what appears to him inspiration, or by grouping of circumstances, finds himself in a specialised position. He may have developed a really useful and novel idea. He may have been given charge of an engineering operation of a highly specialised nature, or he may have been thrust into some particular combination of engineering with another industry or commercial pursuit. Owing to the specialisation, his income rises and he looks upon himself as a made man. At this point his greatest peril lies. The man who is tasting success, especially if such success comes suddenly, is very apt to forget that a very slight turn in the wheel of fortune may leave him deprived of everything he possesses, and unless he has a very good sense of proportion, it is extremely likely that sooner or later he will feel the pinch. We could cite cases—more than one is at present in our mind—in which men who have rendered service to the community in research and discovery, which could only be described as glorious, have found themselves in most distressing circumstances. Philosophy is poor consolation in such cases. Practical sympathy would be much more to the point, but can very often not be administered without causing severe damage to *amour propre*. At any rate, one can do all that lies in one's power to urge young men in our profession to guard themselves against letting their undoubted genius cause them to lose their sense of proportion. The man who finds himself at any time debarred from falling back, if necessary, into the groove of the general practitioner is in a dangerous position.

Yet another word may be said, and we say it with some hesitancy, as we feel that it may be open to serious challenge. We feel, however, that the time has come when the electrical engineering industry should carefully examine its general position with a due sense of proportion. Mathematical precision cannot, of course, be attained, the problems are too complex, but a general suggestion may be made. In the first place, electrical engineering is becoming more and more a matter of finance. We know a great deal about the scientific possibilities, and, given a certain problem, we can usually solve it in an engineering manner. The majority of engineers, however, when confronted with the financial aspects of a problem, are often amazingly ignorant. By this we do not mean how much it is going to cost to build and maintain a certain plant, but we refer to those wider economic problems which lie at the base of every industry. Lack of knowledge on these points explains why the commercial man has usually the whip hand over the technical expert. Can it be fairly said either that our technical colleges and universities pay adequate attention in the training of our engineers to matters of commercial economics, or that our representative engineering institutions deal at all seriously with the business side of our profession?

If a due perception of this point could be gained, very much more would follow clearly which at present is foggy with doubt and discussion. Branches of engineering such as the gas and electrical professions, to quote only one instance, are armed and rival camps, whereas they ought to be co-operative forces, and would be if the knowledge of commercial economics had sufficient influence to produce a proper sense of proportion. Coming closer, we have in our own ranks dissensions which, at times, are apt to become almost rancorous between electricity supply engineers, electrical plant manufacturers and others. As a final word, is it not possible that a large amount of the devastating strife which at present exists between capital and labour in our own industry as in others, arises simply and solely from an absolute blindness on both sides to a sense of simple proportion?

Ultra-Violet Rays.

Any stick—even a dirty one—is good enough to beat a dog with; and the enemies of the electric light have never been fastidious as to their choice of weapons when they have had an opportunity of dealing it a foul blow. Therefore we are not surprised to find the ultra-violet ray bogey resurrected from time to time, although the spectre has been laid repeatedly. We must admit, however, that we are surprised to meet with an oculist who is not aware of the elementary facts with regard to ultra-violet rays.

In an interview with a Birmingham oculist, a reporter of the *Birmingham Daily Mail* was informed "that incandescent gas was less hurtful to the eyes than the electric light, on account of the ultra-violet rays of the latter," and this opinion was given a prominent position in the issue of that paper for October 30th. Although the fact is probably well known to all our readers, it is necessary once more to state that ultra-violet rays cannot penetrate even a thin layer of glass. The flint glass of which lamp bulbs are made is practically opaque to these rays; and even the atmosphere absorbs them to a considerable extent. Every incandescent electric filament, whether of carbon, tantalum or tungsten, is necessarily enclosed within a glass bulb, for if it were exposed to the atmosphere while incandescent, it would be instantly destroyed by burning; hence it is a physical impossibility for any incandescent electric lamp to emit the least trace of ultra-violet rays. Arc lamps are also invariably provided with glass globes completely surrounding the arc, and therefore are equally guiltless of the emission of ultra-violet rays. The same is true of mercury-vapour lamps. The question whether such rays are produced by the filament or the arc is wholly immaterial, for even if they exist within the bulb or globe, they cannot possibly pass through the glass screen which is *always* interposed between the luminous source and the observer.

It is, therefore, an incontrovertible fact that electric lamps, of whatever kind, never emit ultra-violet rays. The matter has been experimentally investigated by many scientists, and the facts have been established beyond doubt or question.

The Lead Position.

The main course of movements in the lead market continues one of firmness, though there are interludes when the tendency becomes rather listless and when prices show a halting tendency. These reactionary moments are, however, only what are to be expected, and they occur principally when a little speculative material has to be realised. There is never any particular wish to make things easy for the speculator who takes a hand in lead, and the consequence is that it is not an easy market to deal in. When the suspicion once gains ground that an outsider wants to realise his holdings, there is an almost unanimous recession on the part of buyers, with the result that the material to be liquidated is parted with under reactionary conditions. A very healthy indication lately has been the marked disposition for the price of far forward deliveries to creep up more nearly towards the level of the nearer dates. This probably arises in part from two causes, first, the lessened disposition to sell forward lead by those whose operations in this direction have for a long time cost them dear, and second, to a trifle more inquiry for distant material. These two factors operating conjointly have contributed to give the market a sounder appearance, and the future is regarded as being more assured. All the news to hand from Mexico fully bears out what has been stated in these columns from time to time. The hopes entertained a month or so ago that the country was settling down to more peaceable conditions have been dispelled again, and as far as can be gathered the position at the big Torreon smelter is just as bad as ever. It is difficult to understand how industrial operations can be carried on at all in the midst of the human butchering which is going on, and of the ceaseless conflict between

mutually destructive forces. These have been making a dead set at each other in the Torreon district, and their attentions to each other have destroyed all chance of the early resumption of lead shipments from there to Europe. The continued absence from the market of Mexican lead is inevitably tending to stiffen up prices, because of the scarcity which manifests itself as the result, but yet the world manages to scrape along somehow, though as far as can be ascertained the reserves are down to a very low ebb. The price, however, pretty well reflects the position, and while it is hardly likely values can advance very much with the poor general trade reports, and the flabbiness of sentiment generally owing to talk of the trade reaction, there is yet no reason why consumers should anticipate any material relaxation in the rates ruling at present for lead. As has been pointed out above, the best informed market opinion is disposed to look for a prolonged period of scarcity, as is indicated by the reduction of the premium which immediate and near deliveries command over forward, and this is hardly likely to be accompanied with any material relief in the position as regards prices. Consumers are taking material as sparingly as they can manage to do, and their reserve stocks must be quite inconsiderable, for the policy of hand to mouth buying has been persisted in now for many months. While the export demand, which a few weeks ago assumed rather considerable proportions, has subsided to a certain extent, there is yet for all that a steady inquiry for material for shipment, and the interest taken by Russian buyers continues. From the inquiries which have been made lately among the electrical people, consumption there seems to remain pretty well as good as ever, but there is still the same slackness and indifference experienced in connection with the building trade, where naturally the season of the year acts as a deterrent upon fresh enterprise, while this section is, of course, influenced by the quiet condition of general trade. The consumption by the electrical trades is regarded as being likely to continue good for quite a time yet, not only in this country but also on the Continent and in America. The supply of material in the United States is, of course, being affected by the Mexican trouble, but the price there is regarded as being rather low, and any alteration for the better in the industrial outlook might easily have quite a sharp influence upon the market.

Australian Trade and Industry.

The Australian Government has recently appointed an Inter-state Commerce Commission to inquire into all matters concerning the trade and industry of the Commonwealth. It is one of the duties of this Commission to inquire into the conditions under which Australian manufacturers work, particularly in relation to the competition which they have to meet from imported goods and the effects of the existing rates of Customs duty. As a preliminary to its investigations, the Commission has dispatched to existing manufacturers a list of 29 questions, which it apparently expects to have answered. It would be difficult to think of a question which is not included in this schedule, and it is most unlikely that anyone but a practised statistician could give the necessary replies. Not satisfied with this, however, the Commission has also prepared a list of questions to manufacturers "who desire to have the tariff modified to suit some industry that they have in prospect." This list is even more exacting than the other, and to give an adequate reply would require a knowledge of manufacturing and distributing conditions all over the world. If the Commission is successful in obtaining satisfactory replies to its questions and can tabulate the results, its report will prove a mine of valuable information, not only for Australian interests, but for the whole of the manufacturing world.

In this connection, the Board of Trade is informed by the Trade Commissioner in Australia that the Commission will be prepared to consider evidence at an early date with regard to the operation of the tariff and the preference accorded to British manufactures. It is accordingly recommended that British firms having representatives in Australia should at once communicate with those representatives if there are any matters that they may wish to submit for the consideration of the Commission. His Majesty's Trade Commissioner will be ready to render whatever assistance he properly can in connection with the matter. Whilst firms locally represented will thus be in a better position to place their views before the Commission, inasmuch as their representatives will be able to give oral evidence if called upon, it has been ascertained that the Commission will be prepared also to consider the sworn affidavits of British firms which are not represented locally. Any such affidavits should be forwarded to His Majesty's Trade Commissioner, Melbourne, either directly or through the Board of Trade. It is understood that the Commission is likely to attach more importance to representations from individual firms affecting their particular business than to general representations from trade associations or Chambers of Commerce.

From previous experience we know that the Australian Government is well disposed towards British goods, and that, after a natural consideration of Australian interests, it is prepared to give a preference to our goods in competition with foreign. It will, therefore, be well for our manufacturers to study the tariff rates of duty which they now have to pay in Australia, and to make such representations as they may deem necessary. It is, of course, impossible to say what the result of such representations may be, but apparently the British Trade Commissioner is in close touch with the Government, and will be prepared to back up any arguments which may be placed before him, and which seem to be reasonable, having in view the protection of Australian interests and the safeguarding of the revenue.

The Electrical Industry and the I.E.E.

At the opening of the new session of the Institution, with advance copies of the chairmen's addresses raining upon us, we are struck with a certain feature which more or less prominently characterises them all. They all look to the future. We have already commented upon Mr. Vernier's weighty remarks on the larger aspects of electricity supply and the requirements of electric traction on our railways; Mr. Proctor concerned himself more with local considerations, but evinced a similar interest in coming developments, and an optimistic view as to the rapid growth of "other uses" of electricity. In passing, we may say that we see no immediate reason to anticipate the arrival of a 50-candle, 200-volt, 25-watt lamp for a long time to come, and there is no need for supply engineers to worry themselves unduly on this score. Dr. Marchant, in his striking address, of which we give an abstract in this issue, also looked ahead, and while uttering a serious warning as to the inevitable result of starving the rising generation of electrical engineers, supported Mr. Vernier's forecast of the coming electrification of our railways. Last to hand is the address of Mr. Woodhouse, who appropriately follows Mr. Vernier's essay on the generation and distribution of electricity with a consideration of the better utilisation of the energy of coal, while he foreshadows a period when, by centralisation and co-operation, electricity will play a predominant part in the distribution of energy.

We are all, in fact, looking forward to see what the future will bring forth, and we are looking to the Institution of Electrical Engineers, rescued from the danger of becoming a purely scientific body with a falling membership and a dwindling influence, and reinvigorated with new blood and progressive ideas, to lead the whole industry along the lines of sound and enlightened development towards the fulfilment of Dr. Ferranti's ideal. We hope and expect to see the Institution taking vigorous and determined action towards raising the status of the profession and improving the position and prospects of its younger members; keeping a keen watch on legislative and administrative proposals, and acting fearlessly and promptly in the interests of the industry when the need arises; promoting research, co-operation and invention, and in every possible way exerting itself in the cause of progress and reform. So shall it become, as prophesied by Mr. J. F. C. Snell, the premier engineering institution of the Empire.

D

ELECTRICAL ACCIDENTS IN MINES.

From the reports of H.M. Inspectors of Mines we find there were in 1912 11 fatal accidents and 33 non-fatal accidents in which the persons injured were disabled for more than seven days, due to electricity. Of these only one fatal accident occurred in Scotland, which Mr. Walker, H.M. Inspector for the district, states: "is a record for the Scotland division and reflects great credit on all whose duty it was to supervise the electric plant at the mines." We are in complete accord with this, but we are not quite so sure about what follows: "It is, I think, to some extent due to the good work which is being and has been done by the Association of Mining Electrical Engineers in Scotland, and which has resulted in a better class of colliery electricians, from all points of view, being employed at the majority of the mines. These officials, I find, as a rule, take an intelligent interest in the installations under their charge, with the result that the supervision is more careful than was the case in former years." We have no doubt the Association will be very pleased indeed with the compliment, and, in fact, it was quoted by the President in his address at the annual general meeting held at Birmingham on October 3rd and 4th last, as proof that the Association was doing good work, but apparently it was the only proof he could produce, and it scarcely agreed with the plaints in the rest of his address. With this, however, we propose to deal on some other occasion; in the meantime it is interesting to note that Mr. Walker also says: "Credit also must be given to the new Electricity Special Rules, and the excellent memorandum drawn up by the Committee who drafted the rules, and it must be gratifying to the Committee that their labours to obtain safer working in mines appear to have begun already to bear fruit," and we are inclined to give much more credence to this extract than to the former. Mr. Walker might have added that it was credit very easily obtained, as it was a remarkably easy task to draft rules insisting upon better plant being installed and better maintenance. There is, we think, ample evidence of this in the Inspector's previous reports, from the number of notices given to owners to put their installations in order, to comply with the new rules.

The fatal accident occurred at Kenmuir No. 3 Colliery on September 4th, 1912, and caused the death of a coal-cutting machine-man. Three-phase current at 440 volts, supplied by the Clyde Valley Electric Power Co. from a sub-station, was used, and deceased received a shock from the machine owing to the plug connection between the trailing cable and the machine being wet, due to water falling on it from the roof of the seam, thus allowing leakage to the machine frame. The frame of the machine was connected by a length of 7/20 cable to the gate-end box, and then by a length of 19/18 cable to an earth plate at the surface, a distance of about 600 yd., and there was also an intermediate earth-plate in the sump at the shaft bottom. Mr. Nelson, H.M. Electrical Inspector, visited the colliery and investigated the accident, and was of opinion that the probable cause of the frame becoming electrically charged was that the end of the earth-wire at the surface was fastened to a short length of old rail, in a very rusty condition, buried about 3 ft. in the ground, *so that it was rust rather than metal which was making contact with earth*, and the connection with the earth cable was poorly made. *The latter was so slack that some earth had forced itself between the head of the bolt and the web of the rail.* The plate in the sump it was not possible to examine in position, but it was explained that it merely dipped into the water, and, in these circumstances, it is not difficult to account for its failure. (The italics are ours.) We should think not, and we might ask who was, and what was the training of, the competent electrician in charge? We say *was*, as surely anyone calling himself an electrician, and responsible for such a state of things, could scarcely expect to be retained. Mr. Walker goes on: "It is explained in the memorandum issued with the Electricity Special Rules that earth plates should be sunk in the ground and not simply immersed in water." But how is an earth plate to be sunk in solid rock, and what was the use and object of an intermediate earth plate? and how was it attached? It is practically useless to fix earth plates underground.

As the wet conditions at the colliery were such as to require strict compliance with the special rules, Mr. Walker requested Mr. Nelson to inspect the remainder of the plant, and he "reported that to provide adequately for safety, much remained to be done in improving the standard of insulation"; Mr. Walker then informed the owners that if they did not voluntarily bring all the plant up to the required standard, he would be compelled to give them formal notice to do so, with the astonishing result that "they then decided to stop the working of the seam, as the quantity of coal remaining to work, in their opinion, did not justify the very moderate outlay which would have been necessary." Now, was that real Scotch frugality or "pique," or a little of both? And what value did they place upon the lives of the workmen?

As regards the non-fatal accidents, of which there were nine, Mr. Walker says: "an analysis shows that three were due to abraded cables, in circumstances in which it is reasonable to say that a metallic covering in each case would have prevented the abrasions. Other three were due to failure of insulation of trailing cables. Trailing cables, I fear, *do not always receive the care they require*, nor the close periodical examination which is imposed by Electricity Special Rule 14 (i). The remaining three accidents were due in a greater or less degree to *casual and careless methods of working*." (The italics are ours.)

1. A pony driver received a shock from an unarmoured electric cable, which was suspended by means of pieces of sail-cloth attached to nails driven either into props, or pieces of wood let into the strata at the side of a road.

His pony was taking a full load of coal along the road from the face to a siding; the tub was made of iron, and was fitted with a door at one end which was hinged at the top, and when about 20 yards from the siding the cable was caught on one of the hinges, with the result that the insulation was damaged, and the tub came in contact with the copper core and became "live." The current passed along the tail chain to the pony, and it was killed, while the driver, who was walking between the pony and the tub, received a shock and was burnt. Another driver heard him shout and gave an alarm, and the current was switched off by a fireman, who, on going to the driver's assistance, found he was unconscious. Fortunately, the fireman was trained in "first aid," and at once started artificial respiration, and after half an hour the injured youth regained consciousness, and ultimately recovered. The fireman deserves great credit for the promptitude with which he started artificial respiration and for persevering with it; he has the satisfaction of having, in all probability, saved the driver's life; if artificial respiration had not been immediately resorted to it is highly probable he would have succumbed to the shock he received.

A small fall had taken place from the roof of the road and displaced one of the pieces of wood driven into the strata, and thus allowed the cable, which prior to this occurring was 20 in. from the tub, to come in contact with it. If the cable had been protected by a metallic covering, it was probable that the accident would have been prevented.

2. A pony driver received an electric shock when driving a pony on an underground road. He was taking in an empty tub, and when passing a gate-end box near the face, the tub was derailed and struck the box; at the same time the edge of the tub wheel cut the cable, which was not protected by metallic covering, and caused a short circuit. The gate-end box was placed on the pavement in a small recess near the face, and in the ordinary course of working the tub rails were about 14 in. clear of the box, but, owing to the rails being slewed out of position, the box was considerably nearer the rails when the accident occurred.

This is another instance where armoured cable would, in all probability, have prevented an accident which might easily have had fatal results. The owners of the colliery have since introduced double-armoured cables throughout the mine.

3. A coal-cutting machine-man was slightly burned by the insulation of a trailing cable being damaged by a stone falling from the roof on to it.

4. A coal-cutting machine-man was slightly burned on his arm by a failure of the insulation of a trailing cable.

He was lying by the side of the machine tightening a nut on one side of the haulage pinions, his arm resting on the trailing cable, when the current short-circuited.

5. A coal-cutting machine-man was burned on his left arm when he and another man were making a temporary joint in a concentric cable, the insulation of which had failed two days before. The electrician stated that he had switched the current off and intended to return to the place to make a permanent joint, but other important work intervened and he did not get back. He saw the machine-man, and, as the latter had often been present when joints were being made, told him to make a temporary joint to get the cutting machine started. A piece of wire was being wrapped round the armouring, when there was a flash, and the machine-man's left arm was slightly burned.

Repairs of this kind should only be undertaken by competent electricians, and not by ordinary machine-men, but these men could easily have satisfied themselves before beginning the work that the cable was dead, as the switch was only 150 yards away, and they should have done so.

6. The plug of a trailing cable had become fastened in the socket of a coal-cutting machine, owing to a screw in the plug coming loose in the socket; an assistant electrician was sent to the machine to take out the plug and adjust the screw so as to allow a spare machine-man to complete the cut during the next shift. While he was working at the machine the spare machine-man came in and switched on the current by putting the other end of the trailing cable into the gate-end box, with the result that the electrician was severely burned about his left hand.

The accident was caused by want of care on the part of the injured man, as he failed to put up a notice provided for that purpose, warning persons not to put in switches as men were working on the line at the gate-end box, and also on the part of the machine-man, who, before he switched on the current, should have gone forward to the machine to see that no one was working at it.

The fireman, too, showed a great want of care in not informing the machine-man that the electrician was working at the machine.

In cases of this kind, it is desirable that the manager should make a rule that anyone working at the electrical part of the coal-cutter should first withdraw the fuses at the gate-end box, and keep them in his possession until the work is completed, and also that the current should not be switched on at the gate-end box until the machine-men have been to their respective machines and ascertained that all is ready and everyone is clear.

7. A bencher was burned on his right hand. He was reaching over an unarmoured cable suspended at the side of a horse haulage rope to get a link which was on a ledge of rock, and in doing so touched the cable and received a shock. The fireman was coming towards him, and found the injured man on the cable; with considerable promptitude he seized a coat lying near and hooked it round the man's arm, and pulled him from contact with cable, and then applied artificial respiration, with the result that he recovered in a few minutes.

After the accident it was found that the insulation of the cable was chipped off, probably by a piece of stone falling from the roof or sides, for a length of $1\frac{1}{2}$ in., and a small area of the copper core was bare. If the cable had been protected by armouring, it is probable that this accident also would not have occurred.

8. A drawer, finding a trailing cable was in his way, picked it up to move it, and, owing to the insulation being damaged, his hand was slightly burned. The trailing cable had only been in use six weeks, but appeared to have been roughly used.

9. The coal-cutter machine-man received a slight shock. A short developed between two cables inside the machine, with the result that the frame of the machine and the rails on which it ran became "live," and the injured man received a shock. The earth wire, owing to carelessness on the part of the man in charge of the machine, had not been coupled up to the frame of the machine, and it is, therefore, fortunate that the accident did not terminate fatally.

(To be continued.)

ECONOMISING TRANSFORMER MANUFACTURE.

The improvements effected in insulating materials during recent years have made possible higher voltages in transformers; improved magnetic irons have reduced core losses so far that an efficiency of 99 per cent. can be realised at full load in large transformers; and improved methods of cooling have reduced the weight of transformers per KW. output and the cost of their manufacture. Future improvements in efficiency will be of minor interest to users of electrical apparatus, owing to the larger wastages occurring in other directions, but they will be of importance to manufacturers since, other things being equal, a slight difference in efficiency may determine the placing of an order with one firm or another.

In view of the important advances which have been made in the above directions, it is surprising how little attention

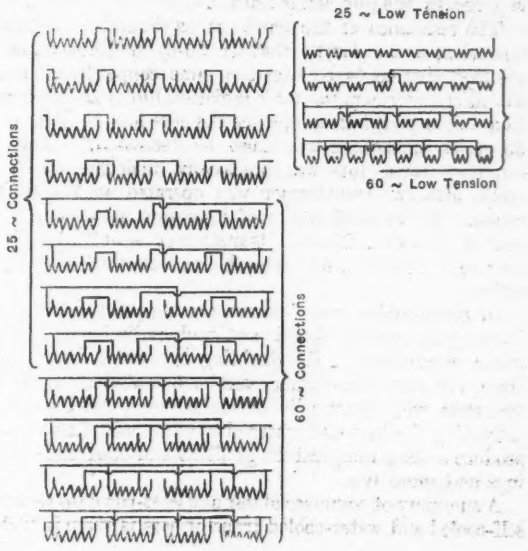


Fig. 1.

has been given to the production of transformers adaptable to supplies of different frequencies. By producing transformers more flexible in this respect, much of the expense at present imposed on manufacturers by the necessity of stocking non-interchangeable apparatus would be avoided, and quick delivery would be facilitated. Obsolescence charges rapidly reduce the value of stock apparatus, and have frequently been responsible for stifling improvements.

The voltage ratings usually available in transformers stocked for operation on a certain frequency are:—H.T., 2,200/1,100 volts; L.T., 450/220/110 volts. This range

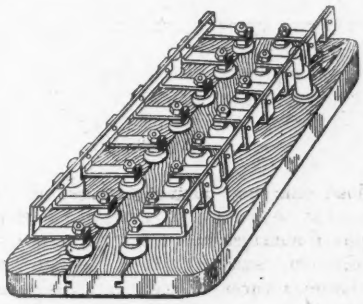


Fig. 2.

covers fairly well present-day lighting and motor circuit needs, but much greater flexibility can be obtained by arranging transformers for multi-frequency operation.

With a view to examining the possibilities of this practice, Messrs. Thornton & Goldman* recently adapted a number of

* *Electrical World*, 61, pp. 402 *et seq.* 1913.

self-cooled and water-cooled 25-cycle, 13,200/4,480-volt transformers to operation on 60-cycle supply. The necessary alterations in connections are shown in fig. 1 herewith; these can easily be made on the connection-board of the transformers (see fig. 2). Owing to the parallel connections of the coils, the number of pressures obtainable in the secondary is one less for 60-cycle than for 25-cycle operation.

In changing from the series 25-cycle connection to the parallel 60-cycle connection, the ratio of turns in series is as 2 : 1, hence the ratio (flux at $25c$/flux at $60c$) = $(60 \times 1/25 \times 2)$, *i.e.*, the flux density is increased in the ratio 5 : 6 by the change from 25 to 60-cycle operation. The eddy losses vary with $(c)^2$ and $(B)^2$, while the hysteresis loss varies with (c) and $(B)^{1.6}$, hence the core loss is greater at 60 than at 25 cycles, and care must be taken that the efficiency guarantee is not sacrificed. The limitations with respect to saturation are at 60 cycles, so far as concerns heating and efficiency of the transformer, but where new alloy steels are used, the magnetising current (dependent primarily on saturation) sets the limit, hence the flux density at 25 cycles is generally the governing feature.

The resistance of the windings, as connected for 60-cycle operation, is one-fourth that for 25-cycle operation, so that the load may be doubled for the same copper loss. In self-cooled transformers the tank radiation limits the permissible iron and copper loss, and, since the core loss is increased at 60 cycles, the copper loss must be decreased. The total core and copper loss was practically unaltered when a 25-cycle, 500-KW. transformer was operated at 750 KW., 60 cycles. By an examination of its design, it was determined that a 500-KW., 25-cycle transformer should be able to operate at 750 KW., 60 cycles, hence tests were made at this rating.

In water-cooled transformers, the temperature rise is kept down by the combined action of tank radiation and cooling-water circulation. By doubling the water supply, a 25-cycle, 750-KW. transformer can be operated at 1,500 KW., 60 cycles, with practically the same temperature rise, but increasing the load and water circulation still further would produce a steep temperature gradient and lead to hot windings and short life.

A summary of commercial test and heat-run data relating to self-cooled and water-cooled transformers is given in Table I,

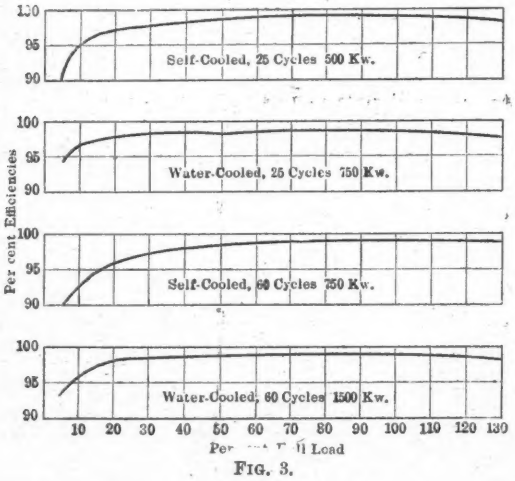

Self-Cooled, 25 Cycles 500 Kw.
Water-Cooled, 25 Cycles 750 Kw.
Self-Cooled, 60 Cycles 750 Kw.
Water-Cooled, 60 Cycles 1500 Kw.
Per cent Efficiencies
10 20 30 40 50 60 70 80 90 100 110 120 130
Per cent Full Load

FIG. 3.

and the load efficiency characteristics of the two types of transformers at the ratings selected are shown in fig. 3.

Changing the connections from 25 to 60-cycle operation doubles the P.D. between turns; though the breakdown pressure between turns of modern transformers is usually over 2,000 volts on test, the fact remains that the insulation between turns is the weakest point in modern transformers, and doubling the P.D. to which it is subjected would probably increase appreciably the frequency of breakdowns.

Adding more insulation, or substituting a little more mica in place of paper, would not only enable a 13,200/4,480-volt, 25-cycle transformer to be used at these pressures on 60-cycle supply, but might even allow of operation at twice these pressures on 25-cycle supply. The core losses would then be rather high, but it would be the greater magnetising current which would limit the pressure increase permissible.

By actual tests, Messrs. Thornton & Goldman verified that a single transformer could operate at all the following ratings :—

	Self-cooled.	*Water-cooled.*
25 cycles at 13,200/4,480 volts or not over 26,400/8,960 volts	500 KW.	750 KW.
60 cycles at 13,200/4,480 volts	750 KW.	1,500 KW.

This result is secured by adapting the transformer to multi-frequency operation and by providing water-cooling in certain cases.

In this country the frequencies concerned would usually be 25 and 50 cycles, but from the accompanying data the necessary modifications can easily be deduced.

TABLE I.—COMMERCIAL TEST AND HEAT-RUN DATA.

	Self-Cooled.		*Water-Cooled.*	
Commercial Tests.	500 KW. at 25 ~	750 KW. at 60 ~	750 KW. at 25 ~	1,500 KW. at 60 ~
Core loss at normal voltage (watts) ...	3,100	6,200	3,150	6,200
Exciting current at normal voltage (%)	10	4	5	2
Full load copper loss (watts)	4,690	2,415	9,670	9,670
Full load impedance drop (%)	4·15	4	—	—
Regulation (%) ...	1·1	—	—	—

Heat-run Data.		*Full load.*	150% *load.*	*Full load.*	150% *load.*	*Full load.*	150% *load.*	*Full load.*	150% *load.*
Duration of test (hrs.)		24	2	24	2	12	2	12	2
Galls., water per min.		—	—	—	—	3·5	3·5	6·5	6·5
Temperature (°C.)	Room	18	14·6	15	16·5	18	16	14	13·5
	Tank—top ...	24	32	25	25	12·5	20	16	22
	Tank—bottom ...	12	18	10	11	6	12	6·5	11
	Oil surface ...	30	39·5	31	32	15	25·5	18	27
	Water—entering	—	—	—	—	13·5	15·5	12·5	12
	Water—leaving...	—	—	—	—	20·5	23	19	18
	Primary coils* ...	41	56	40	45·5	34·5	54	40	55
	Secondary coils*	40	56	40	45	34	42	35	45

* By resistance measurements.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Extra-High-Pressure Cables.

It is with considerable interest that I have read your abstract of Mr. Charles Vernier's address in Newcastle, and in substantiation of the author's remarks on extra-high-tension underground cables, the following particulars may be of interest.

As regards the 45,000-volt three-core three-phase cables referred to in the address, it will be of interest to state that the manufacturers of this cable have lately also supplied a two-mile length of 60,000-volt three-core three-phase cable; naturally both of these cables were not commercially possible with dielectric thicknesses approximating in any way to those specified by the British standard specification on account of, as so ably stated by the author, the excessive cost of lead and armour.

However, the dielectric thickness for the 60,000-volt cable was only ·59 in.; the manufacturers are further able to substantiate Mr. Vernier's proposition by accepting the 11,000-volt British standard specification for 20,000-volt supply; for 11,000-volt cable the thickness of dielectric they employ is ·236 in., which they have used for the last 10 years; this cable they pressure test to 40,000 volts, and they guarantee a minimum break-down test of 100,000 volts.

As regards shaped conductors, they are also in agreement with Mr. Vernier's remarks, as they will only accept these thinner dielectric thicknesses for round conductors; for shaped conductors they require a thicker insulation, which does away with the advantage of shaped conductors. Also as regards dielectric thickness in relation to core section, in this their tendency is in exactly the opposite direction to the

British Standard Specification, inasmuch as they increase the thickness of dielectric as the section of the cable decreases.

I think it was Dr. François Borel who, in an address to the Swiss Society of Electric Engineers, first drew attention to the important factor of surface core tension as determining the dielectric thickness of extra-high-tension cables, and went so far as to suggest that when very high tensions were employed with consequent small copper sections, "it may be necessary artificially to increase the diameter of the conductor by supplying it with a jute core, or preferably placing a thin lead sheath over the copper." This latter method would have the dual advantage of—

1. Increasing the diameter of the conductor, thereby reducing the surface tension per unit area.

2. Supplying a smooth surface under the dielectric; this would not only be better in offering a smooth surface for the paper to slide over, but also would obviate the tendency of small brush discharges, say from the six points of a seven-strand conductor.

In conclusion, the cable manufacturers should be more than grateful to Mr. Vernier for once again drawing attention to this important subject.

E. Coates, M.I.E.E.

London, W., *November 1st*, 1913.

Remarkable Motor Records.

I am pleased that the designer of the motors has, as I intended, written a letter in yours of October 31st. Taking the letter point by point, I may say that I did not assume him to be the writer of the original article, the last paragraph implying the negative more or less clearly. Regarding the figure "160" I "imported," the article states that "without any very drastic change, &c., a machine can be built to give with ease more than twice customary full load." I therefore, I now confess, apparently unjustifiably assumed 2 × 80 to be 160.

The designer now states that the motors were designed to do 120 B.H.P. at 650 R.P.M., whereas the article gave the rating as 80 B.H.P., again as 120 B.H.P. at 230 to 650 R.P.M. on full and half field respectively, implying "shunt variation." Again, it compares them with "other machines of 120 B.H.P. at 230 R.P.M." Surely this makes it clear that the claim is 120 B.H.P. at 230 to 650 revs. on full and weak field. Therefore, as regards the "nature of the design," I must maintain that if, as you state, there are "no very drastic changes in the design," the ordinary laws still hold good, and the time required for the rise to final temperature still occurs when rate of heat generation equals rate of radiation, this being governed by factors—first, energy radiated per time and per temperature unit; secondly, energy-storing capacity of machine per unit increase of temperature. Unless there are "very drastic changes," the relation of above quantities will not be very materially altered, from ordinary practice.

Moreover, to get a minimum time to reach final temperature is it not pretty obvious the machine will be "essentially a copper machine?"

I am sorry to have to confess myself still of the opinion that a commercial competitive machine of this size and speed cannot be built with an efficiency much greater than 87 per cent., "tested" mark, not catalogued. I have carefully re-read the original article, and as a result wish to emphasise my previous remarks.

I hope this letter will make my position clear, that in "criticising" I am trying to get definite justification for printed statements, for the benefit of myself and in "the best interests of the industry," to use your original words. I hope in this discussion I and the writer of the last letter do not get off the "well defined road" or "beaten track" on to "side tracks." On the publication of test data and cost per B.H.P., I shall be the most eager to compliment, and to express my sorrow for my presumption.

At present I am more sceptical than at first.

W. Rae Joss.

Harrogate, *November 3rd*, 1913.

[The reference to "customary full load" related to the customary load of *other* machines of the same size. The machines are still running.—Eds. Elec. Rev.]

Recording Pens.

Following upon the new principle suggested in the interesting paper by Mr. Kenelm Edgcumbe, that the "grapher graphs," it will be readily seen that this gentleman "advers" that, among other things, the modern tendency is towards "some graphers" employing the bucket type of recording pens.

Fig. 3A, on page 650 illustrates the old or tubular type of "Dittmar" pen, and calls for no further comment.

Fig. 3B, however, calls for some explanation in order to differentiate it from the other, and to account for its proved superiority in action. The two parallel dotted lines in the figure indicate a groove, pressed in the side of the bucket, which conveys the ink to the marking point of the pen. The path taken by the ink is, therefore, visible, and this improved and patented form of construction also facilitates the starting and cleaning of the pen.

A. Dittmar.

Shooter's Hill, *November 3rd*, 1913.

Travelling Representatives.

It is a great relief to know that you do not take any responsibility for the views of your contributors, for I have never read such nonsense as that expressed in "Anti-Traveller's" letter. As an old hand "on the road," it is quite evident to me that his knowledge of up-to-date business methods is nil. If representatives are not necessary, why on earth is every manufacturing firm so anxious to obtain the services of those men who know the best buyers and are competent to interest them and sell their goods? Surely not from a mistaken sense of philanthropy! Now-a-days it is more necessary than ever to have good men who are able, by their personality, to procure business, as amongst a large number of first-class firms manufacturing dynamos, motors, &c., there is little to choose in price or quality, and it is up to the representative alone to get the business. The writer might mention that in about eight years he has increased the turnover in this district for his company 800 per cent., the majority of the business being done more or less "on personality."

Traveller.

Cost of Living in India.

I would ask those of your readers who have had experience of life in Calcutta to kindly inform me of the facts regarding the effects of the climate on a British subject, social conditions, and cost of living. In short—is the country desirable to a British subject? and lastly, I seek a word of advice on the matter of remuneration, engagement pending.

A Young Engineer.

[Articles on the cost and conditions of living in India appeared in our issues of May 10th, 1907, and October 18th, 1912; see also letter, November 29th, 1912.—Eds. Elec. Rev.]

Electric Cooking for the Smaller Consumer.

In reply to the letter of Mr. T. Birkett, in which he offers some welcome criticism on the article which I wrote on "Electrical Cooking for the Smaller Consumer," I should like to state that Mr. Birkett has quite missed the point of that article. If he will carefully read the same again, he will see that I do not blame the manufacturer to any extent for not providing the necessary apparatus, I merely state that he will have to provide a cheaper and more efficient apparatus, and that it may be that he will require some urging to discard the present patterns which are selling well, but which will hardly at present meet the cases I mentioned.

The whole object of the short article was to insist that the present attitude of the station engineer with a few cookers on his mains is one which will shortly land him into difficulties unless the cooking load amongst the smaller consumers is cultivated. The figures which I gave for the cost of lighting and cooking with gas at 2s. 6d. a thousand cb. ft. are actual figures, and the bills from the gas company were sent to the Editor as proof of the correctness of the prices and costs mentioned. In many places the cost of gas is con-

siderably below the figure mentioned, and the necessity for an electric oven, which shall be more efficient than the present type, is in such places much greater than where gas is comparatively high priced. I have always admired the manner in which the Simplex people have come forward with a low-priced and highly efficient cooker, and shall be glad to hear from them through the editor, though just at present I cannot offer to subject one of their ovens to a test.

In conclusion, I shall be glad if Mr. Birkett will bring forward the best set of costs for 12 months' use of one of their cheaper stoves; the stove to have done all the cooking for 12 months for a family of six, and the actual bills to be sent to the editor of the REVIEW. If at present this is not possible, then I am sure that if Mr. Birkett will put forward the best results which his firm are prepared to guarantee in order to compete with the circumstances named, the readers of the REVIEW will be very thankful to him.

The Writer of the Article.

THE SOUTH-WESTERN RAILWAY CO.'S ELECTRIFICATION SCHEME.

WE have received the following details of the South-Western Railway Co.'s scheme for electric traction, the outline of which was published in our issue of December 13th last.

Within the last few days work in connection with the electrification of the suburban lines has been commenced at Teddington, and a few notes, therefore, descriptive of the scheme will be interesting, especially to London readers.

The power house will be situated at Wimbledon, immediately to the east of Durnsford road sidings, and adjacent to the main line.

The foundations will be sufficiently far advanced for the erection of the steel structure to be commenced at the end of this year. The building will consist of two main bays forming a boiler house and turbine house, with a switch house attached, and will be 260 ft. long by 210 ft. wide.

There will be two chimney stacks at the west end, each 236 ft. high and 13 ft. 6 in. internal diameter.

A line will be constructed and carried on a viaduct from a point near Durnsford Road Bridge, up into the roof of the boiler house, from which coal may be dumped from wagons direct into bunkers over the central firing floor.

The boiler house will contain, when completed, 24 boilers, each capable of a normal evaporation of 20,000 lb. of water per hour, and of supplying steam at a pressure of 200 lb. per sq. in., and with a superheat of 200° F.

Coal from the overhead bunkers will descend through shoots into mechanical stokers driven by electric motors; economisers will be fixed in the main flues for heating the feed water for the boilers.

The turbine room, when completed, will contain six steam turbines coupled to 5,000-KW. three-phase alternators, which will run at 1,500 R.P.M., and will generate current at 11,000 volts.

There will also be two auxiliary steam turbines coupled through gearing to 400 KW. direct-current dynamos for supplying power for the power house lights and auxiliary motors.

The switch-house will have three floors and will contain all the switchgear for controlling the main generating plant and the outgoing feeders. The main oil switches will be controlled from a desk erected on a balcony on the first floor of the switch-house overlooking the turbine house and will be electrically operated.

Below the turbine house a basement will contain surface condensers, with the necessary air and circulating pumps, together with ten hot wells and boiler feed pumps.

A 40-ton overhead electric travelling crane will span the turbine room for overhauling purposes.

The current generated at 11,000 volts at the power house will be transmitted to nine sub-stations by three-core paper-insulated, lead sheathed and wire armoured cables, and these will in most cases be supported on posts beside the line and will be so arranged as to afford a duplicate supply to every sub-station.

Sub-stations will be erected at Waterloo, Clapham Junction, Raynes Park, Hampton Court Junction, Barnes, Twickenham, Kingston, Sunbury and Isleworth.

The buildings, with the exception of that at Clapham Junction, will be 50 ft. wide and from 65 ft. to 103 ft. long, and will consist of a machine bay and a switchgear bay. At Clapham Junction the sub-station will be located on platform under the gangway.

Each sub-station will contain static transformers and rotary converters, together with the necessary switchgear, for transforming the three-phase high-tension current to direct-current at 600 volts, in which form it will be used by the trains.

Two sizes of converters will be used, the larger having a continuous capacity of 1,875 KW., at Waterloo (4), Clapham Junction (3), Raynes Park (2), Barnes (2), and Twickenham (3), and the smaller, having a continuous capacity of 1,250 KW., at Hampton Court Junction (2), Kingston (2), Sunbury (2), and Isleworth (2).

From the sub-stations, direct-current at 600 volts will be delivered to a conductor rail which will be laid along the line 16 in. from the running rail and at such a height that the contact surface will be 3 in. above rail level.

The rail, of which considerable quantities have been delivered, is of special steel having a resistance of about 6¾ times that of copper of the same length and cross-sectional area, and weighs 100 lb. per lineal yard. It will be supported by insulators fixed on the sleepers and will be bonded across the joints by four flexible copper bonds expanded into holes drilled in the rails before delivery.

Current will be collected from the rail by means of cast-steel collector shoes hung from the trucks, and the return side of the circuit will be formed by the running rails, which will be bonded across the joints by two flexible copper bonds.

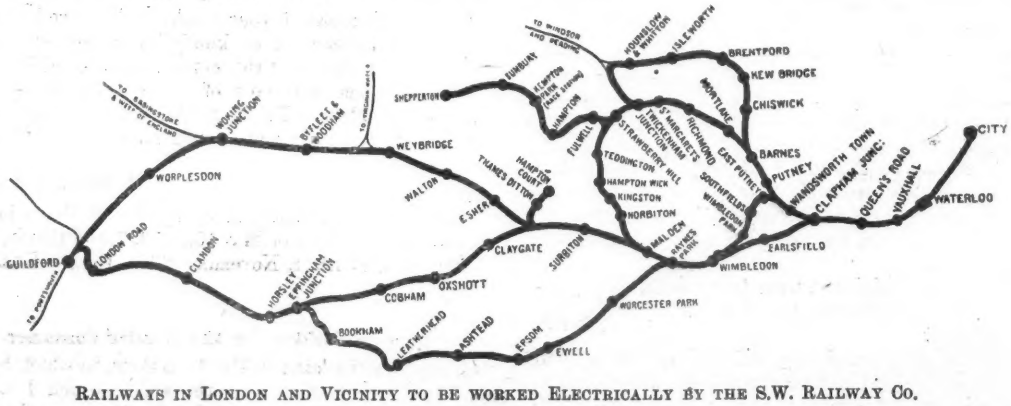
For the first section of the electrified lines, 84 train units are being provided. Each unit will consist of three compartment type coaches, and will be equipped with four motors, each of 275 H.P., together with the necessary control apparatus; these motors will be the largest ever mounted on a passenger coach.

A special motor truck, carrying two motors, will be fixed under each end of the train unit, the remaining trucks being of the company's standard pattern.

The control apparatus will be of the relay automatic multiple unit type providing for uniform acceleration, and controlling from the front driving cab all the motors on a train of any length.

Every train unit will have a driving cab, containing control apparatus for two motors, at each end, two luggage vans and seating accommodation for 190 passengers.

New running sheds and repair shops for the electric trains will be built at Wimbledon, adjacent to the power house, and additional sheds will probably be provided at Hampton Court, Fulwell and Hounslow.



RAILWAYS IN LONDON AND VICINITY TO BE WORKED ELECTRICALLY BY THE S.W. RAILWAY CO.

It is the intention to commence electric working on the Kingston "roundabout" line first, and it is hoped that this line will be in operation before the end of next year.

Electric services on the Hampton Court and Shepperton branches and on the Hounslow Loop line will be added as soon afterwards as possible.

Dust Fires.—Fires in coal mines occasioned by the ignition of coal dust have a parallel in the ignition of sugar dust, which caused the destruction by fire of the Michahelles sugar factory in Hamburg recently—a factory which is among the largest on the Continent. The factory is to be rebuilt on an enlarged scale, and equipped with the latest machinery and improvements, including an electric generating station of its own, and, for the prevention of fires in future, with a most up-to-date electric ventilating system. Firms with specialities of this kind would do well to get into communication with the firm of Gebrüder Michahelles in Hamburg.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Weston Miniature Precision Instruments.

The Weston Electrical Instrument Co., of Audrey House, Ely Place, E.C., have placed on the market a new line of miniature D.C. instruments, made on the same principles and with the same high grade of workmanship as their larger patterns. We have examined a number of these little instruments, and cannot speak too highly of the skill with which they have been designed, or of the manner in which they are constructed; they are made in a great number of ranges and combinations of ammeters, volt-meters, and volt-ammeters, portable and switchboard types, and battery testers, but are all alike in the main essentials. The scale arc subtends 110°, and the length of the scale is 2·6 in.; the movement is dead-beat and practically instantaneous, and friction is reduced to the minimum with hardened polished pivots and sapphire-jewelled bearings.

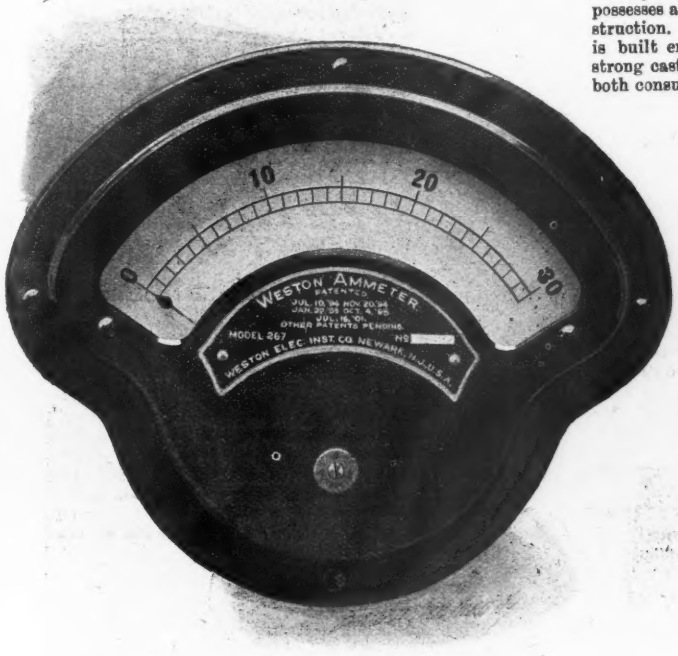


Fig. 1.—Weston Switchboard Ammeter.

The instruments can all be left continuously on full load without overheating or appreciable error, and are practically unaffected by changes in room temperature; the voltmeters have a resistance of about 100 ohms per volt, and the volt-ammeters 50 ohms per volt. Provision is made for adjusting the pointer to zero, from outside. The cases are of steel, finished dead black

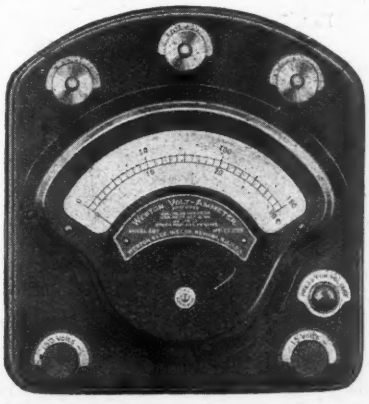


Fig. 2.—Weston Portable Volt-Ammeter.

and dust-proof, and the instruments are all self-contained up to the 50-ampere size. The parts are made accurately to gauge and interchangeable, and the moving system is so light that the instruments are sent by post, and can be mounted on vibrating supports such as the dash-board of a car, without fear of their being injured.

We illustrate the switchboard ammeter, fig. 1, full size, to show the actual appearance of the instrument, which weighs 10·9 oz., and is 1·1 in. deep. Fig. 2 shows a portable volt-ammeter on a reduced scale, having three current and three pressure ranges; the case is of the same size as before, but in this type a base-board is used to carry the terminals. The instrument measures 4·6 × 4·4 × 1·5 in., and weighs 15·8 oz.

The battery testing voltmeter is provided with a detachable contact spike and screw terminal, but otherwise resembles fig. 1.

We understand that these miniature instruments have proved so popular in the United States during the past two years, that it has been impossible to introduce them here until now, the demand there having exceeded the supply. It is interesting to add that Dr. Weston, who first placed his high-grade instruments on the market in 1888, is an Englishman by birth, and remains to this day a staunch British subject.

Watchman Circuit-Breaker.

The advantages of automatic circuit-breakers over fuses in power service, or even in large lighting services, are widely appreciated, but the obstacle in the way of their more extensive use has always been cost. Messrs. Switchgear & Cowans, Ltd., of Salford, have produced a circuit-breaker which, while very low in price, possesses all the features approved in high-class circuit-breaker construction. The "Watchman," as their new circuit-breaker is called, is built entirely on the metal-and-mica principle, enclosed in a strong cast-iron case, and, being operated by a free handle, it protects both consumer and supplier of power from damage to their property

Fig. 3.—The Watchman Circuit Breaker with Cover Removed.

through closing the circuit on an overload or dead short. Bow-shaped laminated copper brushes, renewable auxiliary contacts and carbon breaks are further details which help to make the "Watchman" a sound breaker. It should commend itself to station engineers because it can be set to operate instantaneously at a definite current, which does not vary as time goes on; because, if instantaneous action is not desirable, adjustable delay may be obtained by the application of Statter's patent time-lag, in which case the "Watchman" acts like a fuse, except that the amount of lag is under control; because adjustment having been made, the cast-iron case may be sealed. These circuit-breakers are kept in stock in two sizes, 30 amperes and 150 amperes, drilled for 7/8 conduit, and ready for immediate delivery.

Electric Warehouse Truck for G.W. Railway.

According to the *Railway News* the Great Western Railway Co. has recently purchased a Buckwalter warehouse truck for use at its Swindon works. The truck has a carrying capacity of 4,000 lb., and in steering all the wheels are controlled simultaneously, the turning radius being such that it can run round a post, the man on the truck keeping his hand on the post all the way round. A series-wound enclosed 24-volt motor is fitted, and either an Edison or lead battery—the battery being carried on springs from the frame of the truck, and so arranged that it can easily be exchanged for a spare. A platform for the driver, with a controller and pedal brake, is provided.

These trucks have been largely adopted in America for baggage and goods transport in railway stations, warehouses, works, &c., and are being introduced by the Railway Track Supply Co. (of Great Britain), 81, Gracechurch Street, E.C., who are the agents for this country.

Pipe-Ventilated Motors.

Electric motors are frequently called upon to work in situations where the surrounding atmosphere is far from favourable to the insulation, to the commutation, and to the brush gear, or where it is imperative that they should be protected from explosive gas or dust.

In those situations where motors must be protected from the atmosphere, two alternatives present themselves, (*a*) total enclosure

and (*b*) pipe-ventilation. Total enclosure is a very costly form of protection, and cannot be applied to large motors (of reasonable dimensions); pipe ventilation is the cheaper alternative for small motors, and the only solution for large ones.

In the past trouble has been experienced with some designs of pipe-ventilated motors on account of the fact that a lower pressure existed inside the motor than outside, and, in consequence, oil has been sucked from the bearings into the interior of the machines. In a new line of pipe-ventilated motors which have been designed by the General Electric Co., Ltd., of 67, Queen Victoria Street, E.C., special attention has been paid to this point.

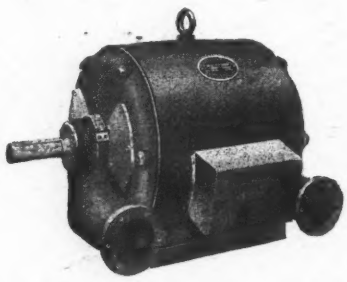


Fig. 4.—60-h.p. Three-phase Squirrel-Cage Pipe Ventilated Motor.

The motors have been designed specially for pipe-ventilated work, and represent the latest practice in this direction.

Considerable interest attaches to the construction of the bearings of these motors. To avoid the suction of oil, which has been previously mentioned, the bearing is completely separate from the casing, a special bracket being provided. A clear space of air surrounds the shaft where it enters the bearing, so that no suction of oil can possibly take place. The slip rings of motors with wound rotors are specially designed to exclude dust, great care being

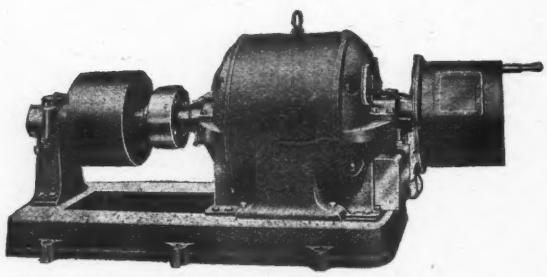


Fig. 5.—250-h.p. Three-phase Slip-ring Pipe Ventilated Witton Motor.

exercised at those points where the short-circuiting bar passes through the slip-ring cover, in order to make the protection against dust thoroughly effective.

The success which has attended the design of these motors is evidenced by the fact that one firm of cement makers has placed two successive repeat orders for the complete electrification of cement works after the first mill had been in operation for a considerable period. To this one firm alone over 7,000 h.p. of pipe-ventilated motors, together with dust-tight liquid starters and other gear, has been supplied by the General Electric Co.

Rolled Steel Gears.

A recent issue of the *Motor* contained an article by Mr. Henry Sturmey descriptive of an American process by which gears of all kinds — spur, helical, herring-bone, bevel and even worm—may be rolled into shape from hot blanks, with not only a remarkable saving in time and some saving in material, but also an improvement in strength; whilst, by means of the process, the production of gears from some alloys of great hardness—silico-manganese steel, for instance—which has not hitherto been accomplished, becomes possible.

In the ordinary way gears are cut from blanks and a great deal of metal wasted, but under the new process, the size of the blank is only equal to that of the pitch line of the teeth, and during the process of rolling the metal required for the formation of the teeth is pressed up out of the body of the blank, so that virtually all this metal usually wasted is saved, as the accuracy of the process is such that gears are produced concentric on both pitch and outside diameter, within ·002 in. and ·003 in. variation, and the diameter will vary, plus or minus, only ·003 in. on an 8-in. gear.

For ordinary machine work the gears can be run in an abrasive mixture for a few minutes, while for the highest class work they can be ground.

From chemical and physical tests carried out, it appears that the rolled gear shows an increased tooth strength of 22·3 per cent. in its normal state and 10 per cent. after being carbonised and re-hardened. The process has been under development since 1909.

The Kesnor Automatic Motor Starter.

Amongst other motor control apparatus, Messrs. Thomas Kesnor & Co., Ltd., of Watford, Herts., have recently developed a line of automatic starters for D.C. motors up to 20 B.H.P. and 500 volts. We illustrate one of these in figs. 6 and 7; it consists of a single-pole main switch and a rheostat operated by a solenoid, and can be controlled by push buttons, pedal or float switches, &c. When the starting button is pressed, the solenoid is energised, and begins to pull up the core; it first short-circuits the starting button, of which it then becomes independent; next it closes the main switch, which is held on by a no-volt coil in series with the motor shunt, and cuts out the starting resistance step by step; this process completed, it allows a catch connected with the main switch to lock the starter in the "pull-on" position so long as the

Fig. 6.—Kesnor Automatic Motor Starter.

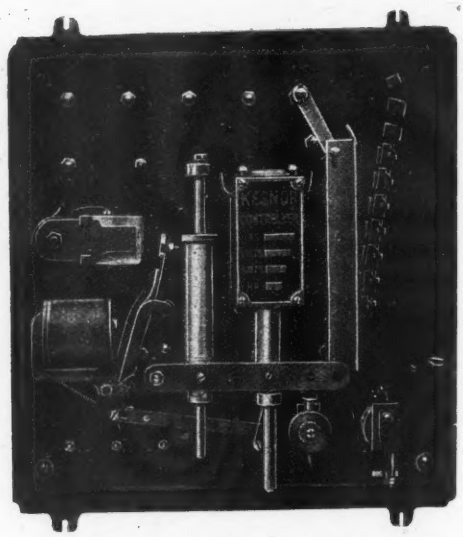


Fig. 7.—Starter Without Cover.

main switch remains closed; and, finally, an electromagnetic trip switch opens the circuit of the solenoid, leaving the starter maintained in the "pull-on" position by the no-volt coil, which consumes only from three to five watts.

The switch is opened by short-circuiting the no-volt coil with a push-button or other convenient device, when the starter at once comes into the original position, and the control circuit is closed again ready for use. Overload release can be provided if desired.

It is claimed that the starter is extremely economical, as the solenoid is only in circuit for a few seconds at starting; the rheostat contacts are carbon blocks working against a copper bar with a revolving motion and flat face-to-face contact over their whole surface. The main switch can only be closed when the whole of the resistance is in circuit, and the starter is completely foolproof. A glazed hinged iron cover is provided. Other Kesnor specialities are a patent elevator controller, push-buttons and relays, gate locks and other elevator fittings.

The Metric System.—The adoption by the Board of Trade of the metric carat of 200 milligrams, in place of the old English carat—which, in harmony with our other brain-twisting units, was defined by the trade by the extraordinary relation 151½ carats = 1 oz. troy—marks another step towards the rationalisation of our weights and measures. The old carat was equal to 205·5 milligrams.

LEGAL.

Sunderland District Electric Tramways, Ltd., v. Newcastle-upon-Tyne Electric Supply Co. and the County of Durham Electric Power Supply Co.

In the Chancery Division Mr. Justice Sargant on Friday, October 23rd, heard a motion in this action, by which the plaintiffs sought an injunction to restrain the defendants from cutting off the supply of electrical energy to their trams.

Mr. Mark Romer, K.C., with Mr. Wheeler, on behalf of the plaintiffs, said that he was asking his Lordship to continue an injunction which had been granted *ex parte*, and which had so far saved these tramways from being stopped.

Mr. Martelli, K.C., who represented the defendants, said that they had no desire whatever to stop the plaintiffs' tramways, but they had been supplying the plaintiffs for a very considerable time with electric energy, and had not got any payment for it. The question between the parties was really one of price, and the plaintiffs had paid the defendants nothing since January last, though they had gone on taking their electrical energy from them. According to the defendants' calculations the plaintiffs owed them £1,800, and even deducting £700, which was the amount the plaintiffs disputed that they owed, there would be still due and owing to the defendants a sum of £1,100. If this injunction was to be continued, he asked that there should be a speedy trial, as it was not fair that the defendants should be kept out of their money longer than could possibly be helped. On any footing they were entitled to £1,100.

Mr. Justice Sargant said he did not see how he could go on preventing them from cutting off the supply unless they were paid for it.

Mr. Martelli said that was all they desired.

Mr. Romer said the plaintiffs were anxious to pay for the supply, and had been so for a long time, and he objected very strongly to Mr. Martelli making these remarks if the motion was not to be gone into. If Mr. Martelli desired to make such statements, he must put in some evidence. He had no objection to the motion standing over to enable the defendants to file evidence.

Mr. Martelli said that if his Lordship could see his way to give them an early trial, the defendants were quite willing to go on supplying the energy until the trial.

His Lordship asked whether it was a case that could be heard without pleadings.

Mr. Romer thought it would be better to have pleadings.

Mr. Martelli thought it was a case that might have been hurried on, the injunction being continued in the meantime, and the plaintiffs undertaking in damages.

His Lordship said that of course he had not yet heard the evidence before him, but it was very unlikely that he would compel the defendants to go on supplying this electrical energy unless they were paid for it.

Mr. Romer said that the plaintiffs were quite prepared to pay the price that they had been paying during the last three years. The defendants said they wanted more, and would cut off the supply unless the plaintiffs paid more. The plaintiffs would be content if defendants would go on supplying at the old rate.

Mr. Martelli said that they were quite willing to go on supplying on those terms until the trial if the time was reasonably short. They would go on supplying on those terms up to Christmas.

His Lordship said he was prepared to hear the action before Christmas.

Mr. Romer thought he would like to know more about the case before assenting to a speedy trial. It was an important question, and one that ought not to be rushed on, and he suggested that the motion should stand for a week to enable the plaintiffs to see the defendants' evidence. They were quite willing to pay for the supply at the original rates.

Mr. Martelli assented to an adjournment, and the motion was directed to stand over until to-day (Friday).

Osram Lamp Works, Ltd., v. Yorkshire Incandescent Electric Lamp Co.

In the Chancery Division on Friday, Mr. Justice Astbury heard this case on a motion for an injunction.

Mr. Lunge, for the plaintiff company, said the motion was for an injunction to restrain the defendants from infringing two patents that were the subject of an action before Mr. Justice Warrington. Mr. Froest, who appeared for the defendants, had now agreed with him to give an undertaking in the terms of the notice of motion.

Mr. Froest said the circumstances were these:—The defendants were charged with infringing these lamps. It was true that they had made a certain number of lamps, but they had not made the filaments, which they obtained from manufacturers in Germany in the assurance that they did not infringe either of the patents When the question was raised by the commencement of this action, at considerable expense the defendants went over to Germany to get the manufacturers to demonstrate to them the process by which the filaments were made under their agreement. The manufacturers there flatly refused to do so. In these circumstances the defendants had absolutely abandoned the manufacture altogether, and they had no intention to further continue the manufacture of any lamps from squirted filaments. He was prepared to give an undertaking in the terms of the notice of motion, and they would probably be able to settle the whole matter, so that his Lordship would not be further troubled with it.

Mr. Lunge: The order might not be drawn up for 10 days, in order to enable us to make it perpetual.

His Lordship said the order could be made perpetual if the parties agreed, in the meantime the undertaking would be in the terms arranged.

Osram Lamp Works, Ltd., v. The Ostra Light Works.

This case was again mentioned upon motion to Mr. Justice Joyce, in the Chancery Division, on Friday, October 31st. In the previous week Mr. Lunge had moved for an injunction on behalf of the plaintiffs, but some question having arisen with regard to the identity of the lamps alleged to have been sold by defendants in infringement of plaintiffs' patent, the matter stood over. Now Mr. Lunge said that both parties had agreed that the motion should stand over without prejudice to plaintiffs' right to press the motion in case the negotiations now going on came to nothing.

Cable Accessories Co., Ltd., v. Wardle Engineering Co.

Before Mr. Justice Joyce in the Chancery Division on Friday, October 31st, plaintiffs, of Britannia Street Works, Tividale, Staffs., moved in the matter of the Patents and Designs Act, 1907, against the Wardle Engineering Co. Mr. Tangye, on behalf of the plaintiffs, said there was a motion to rectify the register by the removal of a design for a form of electric light reflector.

His Lordship: Who is against you?

Mr. Tangye: No one.

His Lordship: On what ground do you propose to rectify?

Mr. Tangye: Anticipation. The design was registered in 1910, and the defendants brought an action against us for infringement. The writ was issued on April 15th, but the defendant committed suicide by craving leave to discontinue, and now comes the counter-blast.

Proceeding, Counsel said he had uncontradicted evidence of anticipation, and the defendants had written saying that they would not oppose the application.

His Lordship: You may take the order.

Elland District Council v. Harling.

Judgment was delivered at the Halifax County Court on Friday, October 31st, by his Honour Judge Longstaffe, in a case where the Elland District Council claimed £21 8s. 1d., from a carrier named John Harling, of Elland, for damage to an electric light standard on Elland Bridge. The facts of the case were that whilst the defendant was crossing the bridge on March 18th last with his horse and cart the vehicle collided with the standard, which stood partly on the pavement and partly in the road, and knocked it down. His Honour, in delivering judgment for the plaintiff Council, said the only point to decide was one of liability. He was not told what right the plaintiffs had to place the standard where it was. The standard had stood in the same position for a number of years, and the defendant had used the bridge frequently. The defendant could not shelter himself behind the fact of any trespass on the part of the Council. He ought to have taken pains to see that the rear of his cart did not collide with the standard. If the standard was so rotten that it tumbled to pieces, he thought it was time the Council put up a proper standard. He refused to allow costs.

Colliery Electrician Fined.

James McNeil, colliery electrician, Wishaw, appeared before Sheriff Shennan, at Hamilton, and admitted a contravention of the Mines Act. The complaint bore that he had, in Dalzell and Broomside Colliery, between March 15th and April 16th, failed to make a thorough examination of all the electrical apparatus in the said colliery (including the testing of earth conductors and metallic coverings for continuity) as often as necessary to prevent danger. After hearing a statement by an agent in extenuation of the offence, the Sheriff imposed a fine of £2, with the option of 10 days' imprisonment, remarking that he hoped the case would be a warning to others.

A. G. Hudson & Co. v. Barnard.

In the City of London Court, on Monday, before his Honour Judge Lumley Smith, K.C., plaintiffs, electrical engineers, 8, Well Court, Bow Lane, E.C., sued Mr. E. Barnard, solicitor, 15, Finsbury Circus, for £61 16s. 10d. for electrically wiring the defendant's house at Bexley Heath. Mr. Wertheimer appeared for the plaintiffs, and Mr. Stuart Bevan for the defendant. Defendant admitted owing £44 18s. 1d., which had been paid into Court.

Mr. Wertheimer said that the defendant told the plaintiffs that all fittings and wires would be supplied by himself, and plaintiffs' business was simply to fit up the installation. A good many things were bought from the General Electric Co., Ltd. Defendant made an appointment to go there with Hudson, the plaintiff, so that the defendant could select the fittings himself. The goods that were ordered in that way were debited to the plaintiff. There was a substantial discount allowed in the trade to persons who were in it, but not to people who were outside of it. It was generally 20 per cent., and 5 per cent. in the electrical trade. When the electrical fittings had been supplied and all the work done, defendant said, "I am not going to pay you for these fittings," and

he tried to get a big discount from the General Electric Co. The company said they were a wholesale house, and that they could not supply the members of the public at wholesale prices. Then it was arranged that the General Electric Co. should charge the plaintiff, and that he would thus get the discount allowed. When the account was sent in by the General Electric Co. defendant was not satisfied, as he wanted 33 per cent. discount off Osram lamps, while the members of the trade only got 20 per cent. The General Electric Co. said they could not allow that, that they would get into trouble with other houses in the trade, that they were a wholesale house, that they had supplied the goods to the plaintiff, who must pay for them, and then, of course, the plaintiff would get the discounts. Plaintiff had paid the General Electric Co., and now wanted the defendant to recoup him, but not less the discounts. Plaintiff's undertaking was to wire the house, and he was to be paid £34 10s. plus £2 3s. for extras. Defendant now said he bought direct from the General Electric Co., but the company denied that.

Mr. Bevan said the defendant had sent his cheque direct to the General Electric Co. after deducting the discount, and they kept it for a month, but on the instigation of the plaintiff the company sent it back to the defendant and took the payment from the plaintiff, which they were quite unauthorised to do.

Judge Lumley Smith pointed out that at present the defendant had got his fittings and had paid no one for them.

Mr. Bevan said the plaintiff had been paid for all the wiring he did.

Judge Lumley Smith: How is the plaintiff to get his money back?

Mr Bevan: He had no business to have paid it.

Judge Lumley Smith: Must he lose his money?

Mr. Bevan said the plaintiff must arrange that with the General Electric Co. Defendant was defending the case on principle.

Mr. Wertheimer said that was why the plaintiff had brought it. It was a matter of great importance to the trade. Every firm in the trade would be boycotted if they gave a solicitor 33 per cent. discount on Osram lamps.

Mr. Hudson was called, and said the General Electric Co. gave him 20 per cent. on lamps, and the defendant wanted 33 per cent.

Mr. Bevan said the General Electric Co. had supplied the defendant for years, and had given him the usual trade discount, and the defendant resented the plaintiff interfering between him and the company.

Plaintiff: The General Electric Co. do not give discounts to private customers.

Judge Lumley Smith: Most wholesale houses say that they will not deal with private people, but they always do so.

William Venus, sub-manager of the accessories department of the General Electric Co., said he remembered the plaintiff coming with the defendant to select fittings, which were supplied. His company supplied their goods through contractors and not to private persons. If they supplied to private persons it would be at retail prices only. They allowed 5 per cent. for cash or 2½ monthly to retail customers. The defendant wanted to take off 33 per cent. and 5 per cent. for cash for Osram lamps. They only allowed the trade 20 per cent. and 5 per cent. As the defendant did not pay the full amount of the account they returned his cheque. They had never debited the defendant with the goods. In cross-examination, he said they would not have treated the defendant as a trade customer without the introduction of the plaintiff or someone in the trade, and then the man in the trade would get the discount.

Mr. Bevan: If Mr. Barnard had come in and said, "Charge these to my account," the contractor would get nothing?—Witness: We should make some other arrangement. The contractor would have had his account credited with the discount. If we supplied Mr. Barnard with the fittings at retail prices and Hudson carried out the work, the contractor would get the discount from the goods.

You would give him a commission?—Yes.

If Mr. Barnard had come in and ordered the goods, and said, "I have a friend in the trade, you have always given me the trade discount before," you would have given it to him?—Not unless he had proof to that effect.

Time after time the year before last did you not serve Mr. Barnard with electrical goods?—I served Mr. Barnard with many things, but not in the name of Barnard, as you will see. They were in the name of Crowdy, of Swindon. He is entitled to trade terms, and he is a motorman. I see hundreds of customers in the course of a week.

You supplied him on his saying he knew Crowdy?—If a customer comes in with a bill with a trade discount off, we cannot dispute the fact that he is in the trade. We cannot say he is not in the trade.

Judge Lumley Smith said he observed that the bill was made out to Crowdy and that "Barnard" was at the top.

Mr. Bevan: You were content in the past days to serve the defendant under the protection of Mr. Crowdy, and give him the trade discount?—Yes, thinking Mr. Barnard was Crowdy. I knew at a later date that he was not Crowdy when he brought the bills and showed the trade terms.

Judge Lumley Smith said if the defendant succeeded in that action, the General Electric Co. might sue him for the discounts he had received. He did not say they would succeed, but there would be the risk.

Mr. Bevan said the defendant would rather pay the retail price to the General Electric Co. than have that sort of thing going on by which the plaintiff attempted to rig the thing to get the discount when he was not entitled to it.

In re-examination, Witness said he believed the plaintiff was the buyer, and not the defendant, when they came to him.

Mr. Thomas, chief accountant to the General Electric Co., Ltd., was called to give evidence as to the custom of the electrical trade in regard to discounts for private customers and other people in the trade, when Mr. Bevan objected.

The Witness said they never allowed the same discount to private customers as to those in the trade. There was a Contractors' Association to which all wiring contractors belonged, and if his company gave any outsider a trade discount, the contractors would naturally complain to the Association.

Mr. Wertheimer: And you would be boycotted?—Witness: Absolutely.

In cross-examination, the Witness said he would supply a private customer, but the man in the trade who introduced the customer, would get the discount.

Mr. Bevan: A trade introduction gets a private person trade terms?—Yes.

Judge Lumley Smith: What does the trade introducer get. Does he get anything? Supposing a man says, "I am introduced by Crowdy," and he gives an order, would you allow him the trade discount?—If this customer wanted to pay cash and he took the goods away, if we were doubtful whether this man was to have the discount we would get into communication with Crowdy, but if we had an understanding with Crowdy that he wanted his customer to have the trade discount, we would charge it under Crowdy's name and let the customer have the discount.

Otherwise you would send Crowdy a credit note?—Yes.

The defendant, Mr. Barnard, said he had bought various goods from the General Electric Co. during the past few years. Crowdy had mentioned the General Electric Co., but he also knew the company quite apart from Crowdy. He had had many dealings with the company, as well as with other electrical companies. Venus always knew he was Barnard and not Crowdy. In fact, he used to chaff Venus about his name. He was running in and out buying different goods for experiments and for electric lighting. He was a practical electrician in an experimental way for his own recreation. With regard to the goods sued for, he made no appointment to meet the plaintiff. Plaintiff could not supply him, and he had made up his mind to deal with the General Electric Co. He examined the fittings he wanted and bought them. Hudson had no authority to pay the company. In cross-examination witness said he did not expect to get the trade discount.

Mr. Wertheimer: Why did you take off the discount?—In their account they offered the discount.

You took the trade discount off?—Yes, I had always been allowed it. I paid the bill in the ordinary way.

Judge Lumley Smith said the question in dispute was whether defendant bought the fittings of the General Electric Co. or whether the plaintiff did. Everybody who had his house wired for electric light went to choose the fittings. On the whole he believed the defendant bought the fittings direct from the General Electric Co. The rest of the case was a scramble for the discount. Venus wanted it for the plaintiff, and he invoiced the goods to Hudson, and Hudson pocketed the discount. On the whole he believed the defendant was in the right. Hudson had not satisfied him that he sold the fittings or was entitled to charge for them. That was all he had to decide. Whether the defendant would have to pay the full amount without the discount was no business of his (the Judge's). The result was that the £44 18s. 1d. paid into Court was enough. Plaintiff would have his costs up to October 31st the time of the last payment into Court, and defendant would have the general costs of that day's trial.

BUSINESS NOTES.

Trade Announcements.—The "K.S.B." Manufacturing Co., of Sheffield, have opened a branch office at 11, Queen Victoria Street, London, E.C., where they will hold a stock of their Klein pumps, fittings and other specialities. Lists have been received from the firm.

The head office of the Tudor Accumulator Co. will, on Monday next, 10th inst., be removed to 3, Central Buildings, Matthew Parker Street, Westminster, S.W. Telephone: 2,600 Victoria.

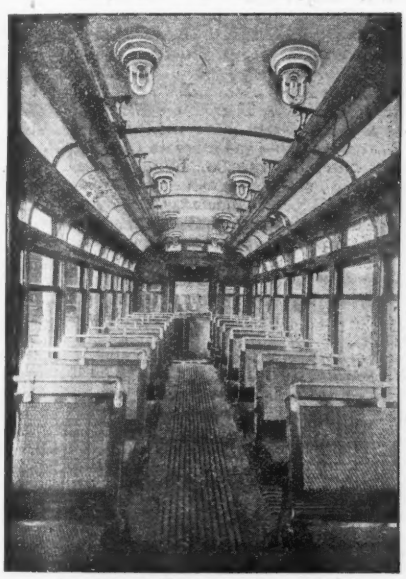
Messrs. John Boyd & Son, electricians, have transferred their office and showroom from 57, Chapel Street, to 5c, Hoghton Street, Southport. The workshops in the rear of 57, Chapel Street are retained by the firm.

Messrs. James Booth & Co., Ltd., of Sheepcote Street Tube and Rolling Mills, Birmingham, have appointed their Mr. Aldam as joint agent with Mr. Prideaux, who for a long period has acted as their agent in London. This alteration has been necessitated by the growth of the London business. The above gentlemen will carry on the agency at 95, Hatton Garden, E.C., under the style of Prideaux & Aldam. Telephone: "Holborn, 4738."

U.S. Tariff Revision.—We have received from Messrs. R. F. Downing & Co., tariff experts, a copy of a pamphlet which they have just published, giving the United States duty rate on every article mentioned in the old United States Customs Tariff, and comparing this in a parallel column with the duty under the new tariff which became a law on October 4th. Manufacturers and exporters among our readers who wish to send goods to the United States can have a copy of this useful 90-page publication free on application to the firm at 17 and 18, Garlick Hill, London, E.C.

Lead.—In their report dated November 1st, Messrs. James Foster & Co. state:—"Closing prices last were, October, £20 1s. 3d.; November, £19 12s. 6d.; December, £19 2s. 6d.; and January, £18 12s. 6d. We have had a heavy appreciation in values this week, the closing prices being, October, £20 12s. 6d.; November, £20 10s.; December, £20; and January, £19 10s., or a rise of 10s. to 17s. 6d. per ton on the week. There is no relief to the continued scarcity of prompt lead, and although there is a large quantity due at the end of next week, little of it will come on to the market, but it will relieve pressing necessities. The export demand continues, and a large business has been done right up to January. Consumers have bought freely October shipment load, and some of them are in desperate straits for want of immediate supplies. The position of lead supplies grows more serious every week. It is generally attributed to Mexico, and although, no doubt, the practical stoppage of smelting in that country for several months has added much to a position already serious, it must not be overlooked that for two years past we have had a constantly recurring difficulty in meeting the requirements of consumption. As we have frequently stated, the world's production of lead has in the 10 years ending December, 1912, increased by only 3·5 per cent. per annum which in itself is quite sufficient to account for the fact that all the large stocks in public warehouses here and elsewhere (in London and New York alone in 1911 there were about 50,000 tons in warehouses), as well as the normal stocks in consumers' hands, have gone into consumption. The market closes very strong with prices at the top of the week—English lead, £21."

Argentine Tramcar Lighting.—The accompanying illustration shows the interior of one of the coaches belonging to the Anglo-Argentine Tramway Co. We understand that all cars



Argentine Tramcar Lighting.

belonging to this company have been fitted with Osram lamps of the standard 100-volt type, manufactured and supplied by the General Electric Co., Ltd., of London.

Edison Electric Vehicles.—Owing to extending business, Messrs. Edison Accumulators, of 49, Old Bond Street, London, W., have taken larger premises and have secured the whole of the building, 1, King Street, and 2 and 3, Duke Street, St. James', which embraces an area of 12,000 sq. ft. These premises will be known as Edison Building. The firm are exhibiting a 2-ton van at the Brewers' and Allied Trades Exhibition at the Agricultural Hall, which opened on Saturday, the 1st inst., and at the Motor Show at Olympia, on the stand of Messrs. Arrol-Johnston, of Paisley, they are showing a three-passenger Edison accumulator car, built by them, and a number of similar vehicles outside for demonstration purposes. On the new premises mentioned above, showroom accommodation is provided for displaying the various types of pleasure and commercial cars, especially the latter. In regard to the progress being made with vehicles equipped with the Edison battery, a repeat order has been received from Messrs. Liberty for two more vans. This firm has proved the advantages of the electric vehicle. Amongst new customers may be mentioned Messrs. Pullars, of dye work fame, who have placed an order for a 1-ton van for use in the London area. The Stratford Co-operative Society have also placed an order for a 1-ton van, and in addition the Ilford Borough Council has ordered a tower wagon for use on its tramway and lighting systems.

Book Notices.—"*Journal* of the Institution of Electrical Engineers." Vol. LI., No. 202. London: E. & F. N. Spon, Ltd. Price 5s.—The issue for October, 1913, contains the following papers:—High-tension Continuous-current Traction, by L. Gratzmuller; Single-phase Traction, by M. Latour; Railway Electrification Problems in the U.S.A., by H. Parodi; Electrification Schemes of the Midi Railway, by E. J. Jullian; Electrification of the French State Railways, by A. N. Mazen; Petrol-electric Motor Vehicles, by J. B. G. Damoiseau; Transmission of Electrical Energy by Continuous Current on the Series System, by J. S. Highfield; Electric Transmission of Energy by Alternating Currents at very High Pressure, by M. Leblanc; Neon Lighting, by G. Claude; Mechanical Devices in Telephone Exchanges, by W. Slingo; Wireless Telegraphy and Time Signals, by Commandant G. A. Ferrie; Electric Locomotives, by F. Lydall; Efficiency of the Polyphase Induction Motor, by A. K. Erlang; Compensation Apparatus for Telephonic Measurements, by A. K. Erlang. Also "List of Members and Officers, 1913."

"*Journal* of the Society of Engineers." Vol. IV, No. 10. October, 1913. London: The Society. Price 1s. 3d.

"Abstract of Current Decisions on Mines and Mining, October, 1912, to March, 1913." By J. W. Thompson. Washington: Government Printing Office.

"*Proceedings* of the American Society of Civil Engineers." Vol. XXXIX, No. 8. October, 1913. New York: The Society.

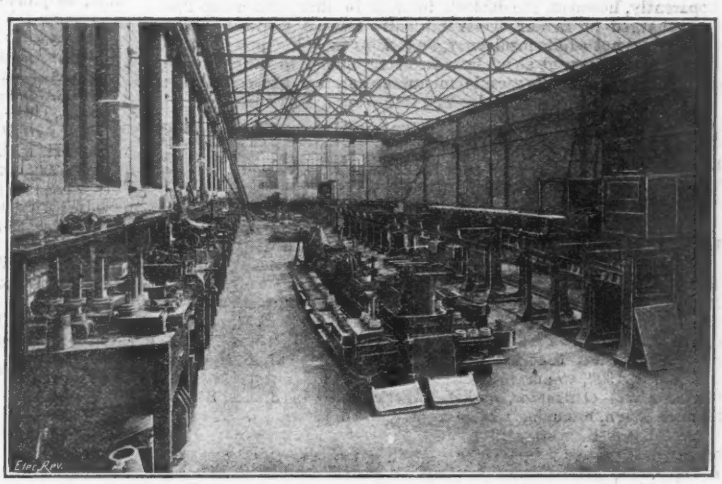
"*Journal* of the American Institute of Architects." Vol. I, No. 9. September, 1913. Washington: The Institute. Price 20 cents.

"Science Abstracts." Vol. XVI, Part 10. October 27th, 1913. London: E. & F. N. Spon, Ltd. Price 1s. 6d. net each.

Messrs. Wm. Dawson & Sons, Ltd., of Cannon House, Bream's Buildings, London, E.C., have issued a new booklet, in which are set out very clearly the subscription rates for a host of British and foreign journals. We are sure that this list should be of service to many of our readers at home and abroad.

"Natural Sources of Energy." By A. H. Gibson. 1913. London: Cambridge University Press. Price 1s. net.

Works Extension.—In the accompanying picture we show a part of the extension recently carried out at the works of



New Switchgear Shop at Reyrolle's.

Messrs. Reyrolle & Co., Ltd., Hebburn-on-Tyne. It is a large well-lighted shop, used for the erection of ironclad and armoured switchgear. The extension was necessitated by the increased demand for Reyrolle switchgear embodying the "complete enclosure" principle, with which they have done so much in recent years.

Bankruptcy Proceedings.—John Dale Nixon (trading as J. D. Nixon & Co.), electrical and mechanical engineer, 65, Mill Street, Crewe.—The adjourned public examination of the above debtor was held on Friday last at the Court House, Edleston Road, Crewe. In answer to the Official Receiver, debtor stated that the ranking liabilities amounted to £1,291, and the assets were estimated to realise £118. He admitted that through bad book-keeping he had omitted to schedule the names of 12 creditors, but the Official Receiver said the amounts were not large. The debtor said that prior to March, 1910, he had not been engaged in business on his own account. For some years prior to that date he had been in the employ of various firms at different periods, carrying on business as electricians and motor manufacturers, and had also been in the employ of the L. & N.-W. Railway Co. In March, 1910, he commenced in business on his own account in Mill Street, Crewe, under the style of J. D. Nixon & Co., without capital. He had never possessed any capital of his own. His father lent him £30 at starting, and he advanced him further sums from time to time—altogether £432. His sister also lent him £200, but they had no interest in the business. No one but himself had any interest in the business. He was on the wrong side from the commencement, and his debts, amounting to £1,293, had been contracted with knowledge of his position. He thought there was an opening at Crewe for an electrical and mechanical engineer, and he had gone on trading in the hope that the business would improve. The Official Receiver pointed out that his books had been imperfectly kept, and the debtor admitted it. He had never attempted to ascertain his financial position. He had lost certain counterfoil receipts since July, 1912, and had no record of his receipts since that time. The entries he had given in his cash

statement were extracted from his bank pass-book. During the two years for which particulars were asked, he had expended £2,272. There was a sum of £194 which he could not account for. He admitted he had "cut" prices in order to get contracts. He put his losses on contracts at £180, and he had paid £200 in law charges. The Official Receiver called attention to various loans made to the debtor, and losses on certain contracts, and asked him if the figures quoted did not point to reckless trading. The debtor admitted they did. He attributed his failure to loss on contracts, want of capital, heavy law costs paid in respect of actions brought against him during the past 12 months for the recovery of the amount of trade goods supplied, and insufficient profit to meet general expenses. There were 38 creditors for fittings, batteries, and ironmongery, &c., supplied, amounting to £616; 10 creditors for cash for work done, repairs, &c., amounting to £34; and three creditors amounting to £643. The Official Receiver said the debtor had not complied with the order of the Court to furnish proper accounts. The examination was, therefore, adjourned *sine die*.

Herbert William Wilson, 28, Alder Road, West Derby, Lancaster, consulting engineer, &c.—In this matter accounts have now been filed, and according to these there are net assets of £6,070 to meet liabilities ranking at about £4,930, the estate disclosing a surplus of over £1,100 on paper. At one time the debtor carried on business in partnership with others as consulting, mechanical and electrical engineers, but a deed of dissolution had been entered into. The deed provided that one of the other partners should realise the assets, and this same partner was to discharge all the firm's liabilities, the partners being entitled each to draw a stipulated weekly sum so long as there was any surplus standing to their credit in a balance-sheet prepared at the date of the deed already referred to. When all the partnership assets were realised the partnership creditors were to be paid, and the balance was to be utilised to repay each or any of the partners any sum that might be standing to his credit in the capital account, and the net balance was to be divided among the partners in the same proportions as the net profits to which they were each entitled. Apparently, however, the debtor's interest in this partnership had been charged in favour of several fully secured creditors. The debtor does not admit insolvency, and states that his present position has been brought about by advancing money to others. One creditor for over £38 is a cable manufacturer, and the account in question is for goods supplied. The following are creditors:—

Foster, J. H., Liverpool ..	£100	"Bankers," Liverpool	£125
Hannay, A. M., Liverpool ..	30	Richard & Co., Liverpool ..	33
Abbott, J. F., Liverpool ..	45	Barrell & Co., Liverpool ..	32
Patchell, W. H., London ..	20	Jackson, F. W., Liverpool ..	20
Wilson, M., Llandudno ..	1,430	Gultone, G. G., Prenton ..	85
Atkinson, R. E., Liverpool ..	100	Higson, P., Manchester.. ..	25

Frank Hucks, of 75, Willingdon Road, Eastbourne.—At the London Bankruptcy Court last week, before Mr. Registrar Hood, an application was made for discharge in this case. The Official Receiver reported that the receiving order was made on June 4th, 1913, on the debtor's own petition. The liabilities expected to rank against the estate for dividend were returned at £777, and the assets were estimated to produce £52. It appeared from the bankrupt's statements, that having previously been in employment he, in October, 1908, commenced business as an electrician, electrical engineer and contractor, at his father's office in James Street, Camden Town, removing in May, 1910, to 18, Charing Cross Road, W.C. From February, 1911, until February, 1913, he carried on business from his private house at 2, Adelaide Road, Hampstead. In May, 1912, he formed a company for the purpose of making aerial flights, and he was employed by that company at the date of the receiving order at a salary of £171 per annum, together with the use of a house at Eastbourne. He alleged his failure to have been caused through losses on contracts owing to his having underestimated their cost, and to ill-health in 1911. The Official Receiver reported that the debtor had committed the following offences against the Bankruptcy Act:—The bankrupt's assets were not of a value equal to 10s. in the £ on the amount of his unsecured liabilities; the debtor had omitted to keep proper books of accounts; and he had continued to trade after knowing himself to be insolvent. The discharge was suspended for two years.

Charles Lewis, electrical engineer, of Seymour Grove, Old Trafford, Manchester, applied to Judge Mellor last Friday for his discharge in bankruptcy. It was stated that since the receiving order in January last, £410 had been paid to the Official Receiver, which enabled all the creditors to be paid 20s. in the £, with interest at the rate of 4 per cent. and left a small surplus after meeting all costs. His Honour granted the discharge.

Catalogues and Lists.—The Electrical Co., Ltd., 122-124, Charing Cross Road, London, W.C.—Catalogue of 92 pages containing full descriptive particulars, with excellent illustrations in colour, of their various types of meters for all conditions of service. They include C.C. ampere-hour and watt-hour meters; S.P. A.C. meters; polyphase meters; pre-payment, two-rate and other meters for special systems; and testing apparatus and equipment. Some pages at the end are occupied with notes on testing meters, method of calibration, and diagrams of service line connections.

Messrs. Siemens Bros. & Co., Ltd., Electric Appliances Department, Caxton House, London, S.W.—Reprint No. 542A contains a full description, with excellent illustrations (interior and exterior views) of their boiler-feed disk water meters for hot water.

Messrs. W. A. Walber & Co., 38, Victoria Street, London, S.W.—Catalogue No. 31 (16 pages) contains particulars of the "Victor" and "Vilvalle" oil, gas and petrol engines, horizontal and vertical types, for electric lighting, pumping and other service. Constructional details, sizes, speeds, weights, dimensions, code-words and prices are given.

The Bastian Electric Heating Synd., Ltd., 185, Wardour Street, London, W.—A cosy and homely postcard showing toasting operations in progress with the aid of the "real red heat" of a Bastian heater. The same picture is being reproduced as a showcard measuring 18 in. × 14 in., and contractors and others interested should write for copies.

The Endolithic Manufacturing Co., Ltd., 61½, Fore Street, London, E.C.—Specimen list of labels in ivory, bone, metal, &c., for electrical and motor-car purposes.

Messrs. Baxendale & Co., Ltd., Miller Street, Manchester.—Catalogue (No. 11,012) of 80 pages, containing illustrations and particulars of a wide range of electric light supplies—incandescent lamps, lampholders, ceiling roses, switches, cut-outs, switch and fuse-boards, meters, wires and cables, conduit and fittings, &c. Prices are set out in detail. A separate supplementary list of four pages deals similarly with some electric light and power accessories—main switches, ironclad cut-outs, and other manufactures.

Messrs. Mitchells, Ashworth, Stansfield & Co., Ltd., 23 and 24, Old Bailey, London, E.C.—Illustrated circular, giving extracts from a number of users of their "Mascolite" for reducing vibration, &c., of engine foundations, &c.

Messrs. Adnil Electric Co., Ltd., Adnil Building, Artillery Lane, London, E.C.—Monthly stock list of C.C. and A.C. motors, dynamos, and portable electric tools. These lists will be forwarded regularly on application.

Messrs. Steel Tubes and Conduits Co., Alice Street, Keighley.—Price leaflet respecting "Stacc" continuity fittings, and stamped steel slip fittings; also one relating to tests of these fittings.

Dissolutions and Liquidations.—The Pure Lubricating Oil Co., Ltd.—This company is winding up voluntarily, with Messrs. C. J. Marshall, of Effingham House, Arundel Street, London, W.C., and C. E. Peczenik, of 11, Pancras Lane, London, E.C., as joint liquidators. A meeting of creditors was called for November 6th at 11, Pancras Lane, London, E.C.

Clive & Co., electrical engineers, High Street, Sutton Coldfield.—Messrs. E. G. Todd & L. A. Evans have dissolved partnership. Mr. L. A. Evans will attend to debts and carry on the business.

The Accessories Manufacturing Co., Ltd., 11, Dean Street, London, W.—A meeting of creditors is called for November 14th at 9 and 10, Pancras Lane, E.C. Statements of claims to be sent to Mr. H. A. McCann, the liquidator, at that address.

Ozonair, Ltd.—This company having gone into voluntary liquidation for the purpose of reconstruction and sale to a new company, whose prospectus is referred to in our "City Notes" to-day, a meeting of creditors is to be held on November 14th at 96, Victoria Street, S.W. Mr. T. S. Wederell is liquidator. The business will be continued at 96, Victoria Street, S.W.

Francis Reade & Co., 35, The Broadway, Church End, Finchley.—Messrs. F. S. Ashdown & C. H. M. A. Vere have dissolved partnership. Mr. C. H. M. A. Vere will attend to debts and carry on the business under the same style and at the same address.

Japan.—A large and increasing trade is taking place in electrical machinery and apparatus in Japan, the imports during the first half of the current year showing an increase of no less than £1,900,000 over the similar period of 1912.

LIGHTING and POWER NOTES.

Argentina.—The municipality of Coronel Dorrego will shortly call for tenders for public electric lighting.—*Review of the River Plate.*

Atherton.—The General Purposes Committee having considered a letter from the L.G.B., as to the scale of charges for the supply of electricity for power purposes, is revising the scale so that the prices charged shall in all cases be brought up to the limit allowed by the present agreement with the Tramways Co. A letter has been received from the Tramways Co. with regard to the terms of the proposed new agreement, and the Committee has decided that until the expiration of 12 months from the date of signing the new agreement the Council will not raise its prices for electricity above the limit allowed by Clause 21 of the present agreement, other than in accordance with the approved new coal clause.

Australia.—A scheme for generating electricity for the railways and for metropolitan lighting purposes was recently laid before the Institute of Engineers by Mr. Edmiston, a Perth engineer. The scheme involves a capital expenditure of £1,776,000, and an annual cost of £200,000, for the production of 60,000,000 units, at an average expense of four-fifths of a penny per unit. Mr. Edmiston suggests that the State should control the scheme, working it in connection with the tramways service, and electrifying several railway lines. The electricity would be generated at Collie coal mines, 130 miles from Perth. Mr. Edmiston estimated the cost of Collie coal at the pit mouth at 4s. a ton. The Perth Corporation now supplies electricity for lighting at 6d. per unit.—*British Australasian.*

The Kempsey (N.S.W.) Municipal Council has decided to raise a loan for the purpose of establishing an electric supply plant in the

town. The estimated cost of the scheme is £6,500.—*Commonwealth Engineer.*

The Newcastle (N.S.W.) Municipal Council has obtained a loan of £5,000 for the purpose of extending the electric lighting scheme.

The Silvertown Co. has purchased a site at Daylesford (Vic.) for the erection of a power house and plant for an electric supply scheme. Operations for the installation will commence immediately. The plant will be in duplicate. Every effort will be made to complete the work before the end of the year.—*Tenders.*

The Williamstown (Vic.) Municipal Council proposes to raise a loan of £42,000 for various works, including the installation of electric power plant.—*Commercial Intelligence.*

Barrow.—The T.C. has agreed to a recommendation of the Electricity Committee, permitting the electrical engineer to advise the Grange U.D.C, with regard to an agreement into which it proposes to enter with a private company for the laying of cables and supply of electricity to its area.

Bath.—Street Lighting.—The T.C. has decided that where new E.L. mains are laid in any street the gas lamps in use shall be converted to electricity, at a cost of about £1 15s. per lamp.

Bexley.—Proposed Bulk Supply.—With reference to the proposed bulk supply of electricity from Woolwich, it was reported to the U.D.C., on October 29th, that the offer, as placed before the Council, was not beneficial, and that if the Woolwich Council liked to make more reasonable terms, Bexley would, in all probability, close with them.

Bispham (near Blackpool).—The U.D.C. is holding an electrical exhibition during the week commencing November 3rd.

Blean (Kent).—Workhouse Lighting.—The B. of G., on October 28th, decided to have an estimate of the cost of providing an E.L. installation at the workhouse prepared by Mr. F. E. Lewis, of Canterbury.

Bridgend.—The auditor's report on the Council's electrical undertaking for the year ended March 31st, shows a net loss of £5, as compared with a net profit of £304 in the preceding year. Notwithstanding this, a sum of £140 was transferred from the profit and loss account to the relief of the rates, leaving a balance of £1,143 to the credit of the undertaking.

Burnley.—Electricity has been installed at the Corporation ice works and cold stores. Messrs. Hy. Wallwork, of Manchester, have carried out the work.

Chorley.—The T.C., on October 31st, decided that consideration of the recommendation of a Sub-Committee appointed to consider the proposed application of the Lancashire Electric Power Co. for a prov. order, be adjourned to a special meeting.

Connah's Quay. — Proposed E.L. Scheme. — The U.D.C. has received a report on an E.L. scheme from Mr. A. J. Leigh, electrical engineer, of Northwich, and has decided to discuss the matter in committee.

Continental Notes.—Austria.—A serious fire occurred last week at the central station of the Austrian General Electrical Co. The fire caused damage estimated at over £50,000, and was only extinguished after two hours' work.

The Austrian Ministry of Agriculture has made a grant to the City of Marburg of the water rights on the River Drau for 9 km. from the Felber Island upwards. The locality is specially favourable for hydro-electric purposes, and some 20,000 H.P. will be obtainable. The City of Graz has joined forces for the execution of the scheme and participation in its benefits.

Spain.—A large plant for the manufacture of nitric acid and other nitrated products by means of the Birkeland-Eyde process, is being established in the province of Lerida by the Sociedad Iberica del Azol. The works will require electric energy to the extent of 25,000 H.P., but the company has contracted to take a total of 75,000 H.P. from the generating station of the Compania Barcelonaise, in Catalonia. The new concern will not only produce fertilisers for agricultural use, but also material for the manufacture of dynamite and other explosives.

Poland.—The Gesellschaft für Elektrische Unternehmungen, of Berlin, is in negotiation for the establishment of a large central electricity station to supply a number of small towns and districts to the west and south-west of Warsaw. A separate company will be formed under Russian law to exploit the undertaking.

Norway.—A power station is being built by the mills at the Tistatos, on the Tista River, which will generate electricity for all the mills in the neighbourhood.—*Board of Trade Journal.*

A 4,000-H.P. turbine set has been ordered from Germany for the Bergen municipal electrical works.

Belgium.—In order to meet the ever-increasing demand for electric power, a new 6,500-H.P. engine and dynamo is being installed at the generating station connected with the works of the Cockerill Co. at Seraing.

The Compagnie de l'Electricité de l'Est de la Belgique is at present supplying current for lighting and power purposes to 13 small towns and villages, and is in negotiation with reference to supplying 14 others. The high-tension mains of the company have a length at the present time of 43 miles, while the low-tension network extends to 80 miles.

France.—La Société des Forces Motrices de la Cere is engaged on the construction of a large hydro-electric generating station at Larcquebrou (Cantal). A dam will be built to collect the water of the River Cere, which will then be conveyed by a canal about a mile long, and through 20 miles of tunnel, in order to secure a fall of about 480 ft. The installation is estimated to cost about £800,000, and the electrical energy generated will be utilised for the manufacture of nitrate of soda.

Coxhoe (Co. Durham).—Proposed E.L. Scheme.—The East Hetton Colliery has informed the P.C. that it hopes to be able to supply electricity to the villages in the district within two or three months, and the Coxhoe, Cornforth, Kelloe and Cassop Councils have decided to confer with the object of adopting a joint scheme.

Darlington.—L.G.B. Inquiry.—Mr. T. C. Ekin held an inquiry on October 29th, into the application for sanction to borrow £21,190 for extensions to the electricity undertaking. The town clerk said the output last year had reached a total of nearly 4,000,000 units; the capacity of the plant had been increased to 2,435 KW. last year, and they were at present putting down an additional set of 1,000 KW. They were now supplying over 1,300 consumers, which included the majority of the large works in the town, and the motors connected represented a total of 4,534 H.P. They had shown a surplus each year, including the first complete year of working; last year the surplus amounted to £5,295. The gross profit for the last 10 years had averaged more than 10 per cent. on the capital outlay, and last year it was over 13 per cent. The total cost per unit, excluding interest and sinking fund, was ·51d. last year. The increase in output for the year ended March last, was over 1¼ million units, and the increase for the six months ended September last was nearly three-quarters of a million units. The maximum capacity of the generating plant, including the batteries, and allowing one set as spare, was about 1,900 KW., and the maximum output last winter was 2,015 KW.; this year the maximum output would probably reach 2,400 KW. The new plant in respect of which the application was being made, consisted of a 1,000-KW. turbo-alternator, with condensing plant, two rotary-converters, high and low-tension switchgear and an extension of the building to contain the high-tension switchgear, also a water-tube boiler, a Green economiser, two superheaters for existing boilers, a boiler-feed pump, and a water-softening plant. The application also included the provision for mains extension and transformers. With respect to the latter, the item of £1,500 included proposed transformer sub-stations and switchgear, as well as the transformers themselves. The new plant is to be on the high-tension three-phase A.C. system. As it was necessary that the plant should be installed in time to meet the coming winter's demand, tenders had been accepted and the work was in hand. There was no opposition.

Darwen.—The Electricity Committee has decided to supply electricity for lighting and power purposes to Spring Vale Paper Mill.

Dewsbury.—Domestic Tariff.—The T.C. has decided that from January 1st, 1914, an alternative system of charging be adopted, on the basis of 15 per cent. per annum on the rateable value of the consumer's premises, and ¾d. per unit for electricity consumed for domestic purposes only. Consumers adopting this alternative system must use heating or cooking appliances on the following scale:—Rateable value not exceeding £30, 2 KW.; rateable value of £30, and not exceeding £50, 3 KW.; rateable value over £50, 4 KW.

Gillingham (Kent).—Residents in the Hempstead and Wigmore districts of the borough have petitioned the T.C. for a supply of energy for lighting, and the Council has decided to ascertain the probable demand and the cost of affording a supply by means of an overhead cable. Mr. L. Hewitt, having asked for terms for current for lighting and power at a proposed screw factory to be established in the town, the Council has decided to give a supply for power at 1½d. per unit on a minimum of 50,000 units per annum, with ordinary rates for lighting.

Glasgow.—The report of the convener of the Electricity Committee and chief engineer, Mr. W. W. Lackie, on their American visit, when they inspected the power plants and works at Montreal, Toronto, Niagara, Chicago, Pittsburg, New York, Boston and Schenectady, has been issued. Information was sought with a view to obtaining the most modern practice in connection with extensions to the Glasgow undertaking, in connection with which it is proposed to build a new generating station on the Dalmarnock Road site, to accommodate 10 13,000-H.P. units. The report details the extraordinary progress in electrical supply in the places visited, in connection with lighting and power, and mentions that over 3,000 electric broughams are in use in Chicago. As a result of the visit much information has been obtained as to the design and operation of power plants of the size contemplated for the new station at Glasgow, also valuable suggestions for the future development of the use of electricity in the area.

Gloucester.—The R.D.C. has given permission for the City Council to supply electricity to houses in the parish of Longford.

Harrogate.—L.G.B. Inquiry.—Mr. T. C. Ekin held an inquiry, on October 31st, concerning the application of the T.C. for sanction to borrow £9,439 for extensions at the electricity works. There was no opposition.

Hoyland (near Barnsley).—The borough electrical engineer of Barnsley having reported on the development of the Council's E.L. order, the surveyor has been instructed to confer with him as to the details of the proposed scheme, and a canvass is to be made at once of the prospective consumers.

Heywood.—Bulk Supply Inquiry.—On November 1st and 2nd a B. of T. inquiry was held in London into the proposal of the Heywood Corporation to obtain a bulk supply estimated at 2,000,000 units per annum, from the Bury Corporation, to which arrangement the Lancashire Electric Power Co. has refused its consent. Both the Bury Corporation and Power Co. submitted terms to the Heywood authorities, who approved the Corporation's offer. Mr. H. Lloyd, K.C., for the Power Co., said the question at issue was simply whether the consent of the company to the agreement had been reasonably withheld. The company was a pioneer in the provision of electricity, and if the public was to be asked to contribute money to such enterprises, it should be asked to do so upon fair terms. The offer of the company was fair and reasonable. Mr. C. D. Taite, engineer and manager to the Power Co., said he did not see any possibility of the estimates given by Bury being achieved. Bury was not in the habit of charging its own customers cost price, even though it was offering light to Heywood at that price. It was a new method of municipal trading to charge persons outside the municipality less than those within. Mr. Keen, replying, said that Bury Corporation was entitled to decide whether it could fulfil this agreement without any loss. If Bury chose to make a loss to the ratepayers so that Heywood could benefit, surely the Power Co. could not say nay.

Holmfirth.—Proposed Loan.—The D.C has resolved to apply to the L.G.B. for sanction to borrow £7,500 for the purpose of installing electricity in the district.

Huddersfield.—The B. of G. was recommended by the Crosland Moor Committee, at its last meeting, to install electric light throughout the estate, at an estimated cost of £700.

Ilford.—Loan Application.—The T.C. has applied to the L.G.B. for a loan of £4,100 for the erection and equipment of a sub-station for the supply of current to the Goodmayes district. It has also been decided to apply to the B. of T. for consent to supply current to Wanstead U.D.C by overhead lines.

Inverurie.—Proposed E.L. Scheme.—The T.C. has received an offer from an Aberdeen firm to submit a scheme for the lighting of the town with electricity.

Japan.—It is proposed to divide the Tokio Municipal Electric Bureau into two sections, one to deal with electric tramways and railways, and the other with electric lighting.

Llanelly.—A series of electric cooking demonstrations and lectures were carried out at the end of October under the auspices of the Llanelly and District Electric Light and Traction Co., Ltd. The lectures, which were arranged by Messrs. Gillespie and Beales, were given by Mr. F. S. Grogan before attentive audiences. The lecturer created general interest in bringing forward the claims of electric cooking, and in demonstrating the results obtained with the "'Tricity" cooker.

London.—L.C.C.—The Finance Committee has recommended the Council to sanction the borrowing by the Fulham B.C. of £5,000 for mains and plant.

Hammersmith.—Loan for Coal Storage.—The B.C. proposes to provide storage for at least 6,000 tons of coal, in order to protect the electricity supply from interference through fluctuations in coal supply. A loan of £15,000 is being applied for.

Lurgan.—Proposed E.L. Scheme.—At a special meeting of the T.C. a report by Messrs. Woodside & Co. on the proposed E.L. scheme was considered. They estimated the cost at £11,338. Mr. T. W. Bloxam, of Belfast, the Council's consulting engineer, said that, in his opinion, the Council was justified in going on with the scheme, which he estimated to cost £11,980. The town clerk and the town solicitor have been instructed to promote the necessary order.

Manchester.—The City Council has agreed to promote in next Session the Bill to secure powers for the erection of a new generating station at Davyhulme, to acquire the undertaking of the Trafford Power and Light Co., and to incur other expenditure; this matter was mentioned in our issue of October 24th.

Market Weighton.—On October 29th, Mr. Charles Pullen, of Bradford, attended the meeting of the P.C., and explained the E.L. scheme which he proposed to carry out. He stated that the cost would be about £1,500, and current would be supplied at 6d. per unit. The Council decided to offer no objection to a company being formed.

Morecambe.—At the last meeting of the T.C. a suggestion was made that the gas and electricity undertakings should be controlled by one committee, but after discussion nothing definite was decided upon. A resolution was moved that the electrical engineer should prepare a scheme for the illumination of all the shelters and bandstands during the season, and for the provision of two illuminated fountains on the promenade, and this was carried.

Penketh.—Mr. A. J. Leigh has been appointed consulting engineer in connection with the electrification of the Penketh tannery; this is the largest tannery in the country, and it is interesting to note the rapid progress being made in this direction.

Salford.—Loans and Extensions.—At a meeting of the T.C. on October 29th, approval was given to the recommendations that borrowing powers be sought to the extent of £13,500 for electricity purposes. The Manchester Ship Canal Co. has given notice that an additional supply of approximately 750 KW. will be required for No. 9 Dock, and the total estimated cost of affording the supply is £15,000, made up as follows:—Land for sub-station, £2,000; sub-station building, £2,000; two rotary converters, £4,500; one three-phase switchboard, £1,000; one continuous-current switchboard, £1,000; mains (for which borrowing powers have already been obtained), £4,500. As the price of energy is 1½d. per unit for the first million units, and 1$\frac{1}{4}$d. for all over, it is expected that the financial results will be favourable. Borrowing powers amounting to £10,500 are to be sought for this work. Councillor McDougall, at the T.C. meeting, said this was one of the most profitable contracts which the Electricity Committee had on hand. In regard to the other matter, borrowing powers for £3,000 are to be sought for affording a supply of three-phase energy in the Ordsall district. The demand for electricity for power purposes in that district continues to increase, and it has been decided to meet the demand by laying H.T. mains from the Frederick Road works to a transformer sub-station in Ordsall, where it will be reduced to low-pressure three-phase current. The estimated cost is as follows:—Land and building, £1,000; two transformers of 500 KW. capacity each, £800; H.T. and L.T. switchgear, with cable connections outside buildings, £1,200—total, £3,000.

Shildon.—The U.D.C. and the representatives of the Northern Counties E.S. Co. have discussed the agreement for public lighting, and the question of the company being allowed to take current from an outside source for a period beyond that of the four years agreed upon. The Council has now passed a resolution to the effect that the agreement of December 31st, 1900, as to the company obtaining current from any other company be suspended for a period of 12 years, on condition that at the end of three years when the company's new plant comes into operation, the company will reduce the charges to private consumers in the district from 5d. to 4½d. per unit.

Shipley.—Street Lighting.—The D.C. is contemplating the purchase of new arc lamps for the improvement of the lighting of the Bradford to Keighley main road where it passes through the Council's area.

South Africa.—The business of the Uitenhage Electric Lighting and Power Co. is to be purchased by the T.C., at the price of £30,000.—*African Engineering.*

St. Anne's.—Amongst new clauses added to the St. Anne's Improvement Bill is one by which the Council seeks power to obtain an extension beyond 1917 to supply current to the Tramways Co.

Stourbridge.—Messrs. Jones & Attwood, of the Titan Works, who have recently added an electrical department, are holding an electrical exhibition this week.

Todmorden.—L.G.B. Inquiry.—An inquiry has been fixed for November 17th in regard to the application of the T.C. to borrow £5,000 for purposes of the electricity undertaking.

Tyneside.—Electric Coal Conveyors.—Three electrically-driven band conveyors for the shipping of coal into vessels, have recently been brought into operation at the Tyne Improvement Commissioners' river staiths at North Shields. Each of the belts is worked by a 20-H.P. electric motor, and the travelling lifting and slewing of the machine are effected by independent motors of smaller power. The maximum height from which coal can be shipped by means of the conveyor at No. 5 staith is 46 ft. above high water or ordinary spring tides. In the case of the conveyors at Nos. 1 and 2 staiths, the maximum height is 39 ft. The heights measured above low water of ordinary spring tide level are 15 ft. more than the figures given. The conveyors have been constructed by the Commissioners' staff, the motors being supplied by the Sunderland Forge and Engineering Co., Ltd. The Tyne Commissioners have now six band conveyors in use at the Albert Edward Dock and the river staiths.

Weston-super-Mare.—The U.D.C. has decided to have the Boulevard lighted by suspended electric lamps of high candle-power.

Wigan.—Proposed Loan, &c.—It has been decided to reduce the price of current for heating and cooking is from 2d. to 1d. per unit.

Application is to be made for sanction to borrow £8,000, the amount of the tenders accepted for the installation of a new turbine and accessories at the electricity works.

Wimbledon.—The Corporation Electricity Department has been holding a series of demonstrations and lectures on cooking by electricity, by Mr. F. S. Grogan, of the British Electric Transformer Co., this week. Two lectures have been given daily, commencing on Tuesday last, and the series closes to-day with those at 3.30 and 7.30 p.m. respectively.

The Electric Lighting Committee has decided to make a fixed charge, from the end of the September quarter, of 3½d. per unit for electricity used principally for lighting purposes in shop premises within the borough.

Worksop.—Workhouse Lighting.—The B. of G. has appointed a committee to consider and report upon a specification drawn up by Mr. Crowther, electrical engineer to the U.D.C., for the installation of the electric light at the workhouse.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—At a meeting of the Tramways Committee tenders were opened for the electrical equipment of six new cars, and it was agreed to accept the offers of the Brush Co. for its inter-pole type motors, and the British Westinghouse Co. for controllers and electrical equipment. It was agreed to bring the proposed doubling of the Market Street line before the Harbour Commissioners and to apply for powers to run motor-omnibuses from Bridge-o'-Don to Tarbethill

Trailer Cars.—The L.G.B. has informed the Tramways Committee that it has no objection to the running of trailer cars, providing that suitable arrangements are made for turning at the termini.

Australia.—The total electrical output in connection with the Sydney tramways (N.S.W. Government) for the year ended June 30th was 89,113,036 KW.-hours, of which the alternating-current supply was 78,090,695 KW.-hours and the direct current 11,022,341 KW.-hours, being a total increase over the figures for the previous year of 11,578,757 KW.-hours, or 14·93 per cent. Thirty-three miles of high-tension transmission cable have been laid underground from the new power house at White Bay to the various sub-stations; a high-tension transmission line, 4¾ miles in length, has been erected between Manly and Collaroy Beach sub-stations, and 48 miles of low-tension feeder cable has been erected at other places. In connection with the existing lines, 22 miles of trolley wire on the City system and 2 miles at North Sydney have been renewed.—*Commonwealth Engineer.*

The Prahran (V.) City Council has approved the proposal to construct electric tramways from Prahran to Clifton Hill, at an estimated cost of £115,270.—*Australian Mining Standard.*

According to the Melbourne *Age*, the Municipal Tramways Trust Bill has been adopted by the Joint Municipal Tramway Conference at Caulfield.

Burnley.—The tramways manager has reported that the period during which the B. of T. consented to the use of a goods wagon on the tramways had expired. The town clerk was instructed to apply to the Board for consent to continue the use of the wagon. The Committee has received a petition from 28 drivers and 21 conductors against a reduction of working hours from 60 to 56 per week, and has adjourned the matter.

Canada.—A first batch of 150 'buses have been built in this country by the Associated Equipments, Ltd., and Daimler Co. to the order of the Canadian Auto-'Bus Co., of Montreal. All the 'buses are electrically heated and lighted.

The Vancouver Council is considering immediate action in the purchase of the B.C. Electric Railway. The company's franchise does not expire until 1919, but Mr. Glover has stated to Mayor Baxter that the company will consider any reasonable proposition. —*Canadian Engineer.*

Continental Notes.—France.—Some experients are at present being carried out on the Metropolitan Railway in Paris with a new system of automatically-regulated traction known as the S.T.A.R., controlled by the Société des Ateliers de Constructions Electriques du Nord et de l'Est, of Jeumont.

Switzerland.—It is estimated that about 80 per cent. of the railway carriages on the Swiss State Railways are now equipped with electric lighting. The dynamo system is mainly in use, being fitted on about five-sevenths of the carriages, while the remaining two-sevenths having the battery system.

According to the *Daily News*, the Government intends to transform all the national railways to electric traction. As a beginning £1,560,000 will be required for the electrification of the St. Gothard Railway to Lucerne, Lugano and Milan.

Hungary.—The electrification of the great State railway lines has been resolved upon by the Hungarian Government, on account of the constantly rising price of coal. Trials have already been made on the electrified Waitzen to Gödöllö section, but owing to the distance which the hydro-electric powers had to be brought, the results were not considered conclusive. Further trials will be made on a line not yet chosen, which offers better means of studying the problem. Technical experts of the Hungarian State Railways are now prosecuting inquiries abroad, the Bavarian electrical railways being the first object of their inspection.

Dewsbury.—At the last meeting of the T.C., the Tramways Committee reported that an interview had taken place between the town clerk and Mr. Garcke, of the B.E.T. Co., with regard to the latter granting the Corporation running powers over its lines from the Market Place to Willans Road, in connection with the tramway extension to Dewsbury Moor. Mr. T. Myers said it had been suggested that a deputation should wait upon the company, but this had not been done, and the company had submitted fresh terms; these, however, were not acceptable to the Corporation, and seeing that the National Electric Construction Co., Ltd., which was to construct the new tramway, wished to abandon its part of the compact, the Corporation was in the same position as it was two years ago. He suggested that the Electricity and Tramways Committee should propose some scheme which the Corporation could carry out itself. Mr. J. E. Kilburn said that the reason of the present negotiations was that the National Co. suggested that the Dewsbury Moor trams could be more economically worked by the B.E.T. Co., and it should not complain if terms were arranged between the Corporation and the B.E.T. Co. The minutes of the Committee were eventually approved

Edinburgh.—At a meeting of the T.C. last week, notice of motion was given to remit to the Tramways Committee to consider and report as to the desirability of approaching the Edinburgh and District Tramways Co. with the object of ascertaining on what terms it is prepared now to terminate its lease with the Corporation, and of preparing a scheme for taking over the whole undertaking, and, further, with a view to securing joint municipal control of the systems in Edinburgh and Leith, to consider the desirability of taking the necessary steps for the constitution of an Edinburgh and Leith Tramway Commission.

Gosforth-on-Tyne.—The Coroner's inquiry into the accident on the Gosforth-Wallsend route of the Tyneside Co.'s system on October 18th, which resulted in the deaths of two men, was concluded on October 30th so far as the death of William Walter Amis was concerned. A verdict was returned of accidental death due to a collision in a dense fog, and the jury recommended that indicators be placed on all single lines between loops throughout the company's system.

Japan.—The Hokushin Electric Railway Co. is the name of a new concern, which has just been formed in Tokio, with a capital of £150,000, to construct a new electric railway, having a length of about 20 miles.

Lancaster.—The T.C. has approved of the suggestion that powers be applied for to run motor-'buses in the portion of the town not served by the tramways, but adjourned the scheme for the request for powers to be coupled with other schemes requiring Parliamentary sanction.

London.—L.C.C.—The Highways Committee has recommended the Council to promote powers for the extension of the tramways from Farringdon Road terminus to Ludgate Circus, from Aldgate terminus to Mark Lane station, from Aldgate to Aldgate station, and from Lee Green to Eltham. The total length of single track is 5 m. 7 f., and the estimated cost £125,880.

Leeds.—The Corporation tramways department has inaugurated a motor-'bus service between Moortown and Shadwell. The vehicle is a petrol-electric 'bus, costing about £850, and capable of accommodating 28 passengers.

New Zealand.—The report of the Christchurch municipal tramways for the year ended March 31st, shows that the net earnings were £54,532, against £49,976 for the previous year, an increase of £4,556. The net surplus was £1,930, against £2,709. The number of passengers carried was 16,060,441.—*Commonwealth Engineer.*

Oxford.—Tramway Scheme Approved.—The General Purposes Committee has approved the report of the Tramways Committee recommending that the scheme of the National Electric Construction Co. for the electrification of the tramways be approved. The scheme provides for petrol-electric cars in the centre of the town, and trolley cars or motor-'buses elsewhere.

Quarry Bank.—At the monthly meeting of the Brierley Hill U.D.C., a communication was received from the Quarry Bank Council enclosing a resolution passed by it to the effect that it thought the time had now arrived when Messrs. Balfour, Beattie & Co. should give a definite statement as to their intentions of utilising their powers in relation to the Quarry Bank and District Light Railway Transfer Order, 1912. Mr. Williams stated he understood that the company had another 12 months in order to complete its obligations. It was, he contended, important that there should be tramway communication between Rowley Regis, Quarry Bank and Brierley Hill. The Council decided to support the action of the Quarry Bank Council, and to forward a similar resolution to Messrs. Balfour, Beattie & Co.

Rotherham.—The T.C. has decided to double the tramway track from the junction of Frederick Street to the pumping station, at an estimated cost of £23,857.

It has also been decided to take up and relay the tramway track in Fitzwilliam Road, and the Council invites tenders for the supply of rails and points required.

Salford.—In the next Parliamentary Bill renewed application is to be made for powers to run motor-'buses in connection with the tramways undertaking.

Southend-on-Sea.—New Loans.—The T.C. is applying to the L.G.B. for a loan for the purchase of additional tramcars for the pier, and the tramway is to be extended at a cost of £2,175.

South Yorkshire.—Powers are being secured for a big project to link up by a tramway the colliery villages between Barnsley and Mexborough, involving the construction of a line extending 15 miles, and a proposal for the electric lighting of both the route and the district. The Urban Councils of Wombwell, Wath-on-Dearne, Bolton-on-Dearne, and Thurnscoe are the promoters. Mr. Stephen Sellon is the engineer, and the promoters also have the advice of Mr. J. B. Hamilton, general manager of the Leeds tramways. Application is being made to the Light Railway Commissioners, while in respect of the electric lighting undertaking a prov. order will be obtained. It is expected the works will be put in hand towards the end of next summer.

Todmorden.—At the monthly meeting of the T.C. it was reported that there was a net profit from the motor-'bus service during the past six months of £485.

Sunderland.—Interrunning Scheme Abandoned.—The Tramways Committee has decided not to proceed with the proposed prov. order to grant powers to the Sunderland and District Electric Tramways Co. to run cars into the borough. It is understood that the reason for the revocation of the Committee's former decision is that the company would not give an undertaking that the cars running into the borough should not have outside advertisements, or indemnify the Corporation against any action that might be taken by advertisers who had contracted with the Tramways Committee.

TELEGRAPH and TELEPHONE NOTES.

Anglo-French Telephony.—The new scale of charges for telephone calls between France and the United Kingdom came into force on Saturday last. For the purpose of the tariff, each country has been divided into three zones. In the first British zone are included the Southern and South Midland counties, in the second the rest of England and Wales, and in the third Scotland and Ireland. The majority of the towns in France admitted to the Anglo-French telephone service are situated in the first French zone; the principal exceptions are Belfort, Cherbourg, Dijon, Epinal, Le Mans, Limoges, Lyons, Nancy, Nantes, St. Etienne and Tours, which are included in the second zone, and Bordeaux and Marseilles, which are situated in the third zone. The following table sets forth the new tariff:—

For a call of three minutes during the day from—	To a town in first French zone.	To a town in second French zone.	To a town in third French zone.
A town in first British zone ...	4s.	6s.	8s.
A town in second British zone ...	6s.	8s.	10s.
A town in third British zone ...	8s.	10s.	12s.

The charges for single calls between the hours of 9 p.m. and 7 a.m. in summer, and between 9 p.m. and 8 a.m. in winter, will be three-fifths of the charges stated above. The period of winter comprises the months from November to February, inclusive. The charges for subscription calls effected at fixed times every night for a period not shorter than one month will also be reduced, the new rates being based on the revised tariff for calls during the day.—*Times.*

Norway.—The Post and Telegraph Department has had plans worked out for the erection of a system of wireless telegraph stations around the whole coast from Christiania to the Swedish frontier in the south, and the Russian frontier in the north, which are to be placed at certain distances from each other, so that communication can always be maintained between two or three stations. According to the plans, there will in all be 14 stations in addition to the big Marconi station under construction, of which some have already been in operation for several years. Of those already completed may be mentioned the station at Röst, which is the last of the Lofoten Islands, and that at Ingö, which was specially built for wireless communication with Spitzbergen. The most northerly station will probably be erected at the town of Vardö, in Finmarken. This station will be equipped with sufficient power to be able to keep up connection with the Ingö station on the one side, and with the Spitzbergen station on the other; it will be of immense importance, not only to the Norwegian coast steamers, but to the international tramp steamers, of which hundreds pass Vardö on their journey to and from Archangel and all other places in the White Sea. The Russian Government is said to have prepared a similar scheme for building wireless stations along the whole Murman coast, from the Norwegian frontier to the White Sea in the first instance, and from there along the northern coast of Siberia, as far as the climatic conditions will allow of it. The Vardö station will thus be connected with the Russian stations as well as those before mentioned. As regards the wireless station at Christiania, it was at first intended to build it on one of the hills behind the town, but this plan met with so much criticism in the Storthing, that the necessary money was not granted, and it had to be given up. Experts have recently visited several places nearer to the coast for the purpose of finding a more suitable site.

The first conversation by telephone between Christiania and Harstad took place a few days ago, marking the completion of a section of the big scheme of connecting Christiania by telephone to Hammerfest, Vardö and Vadsö in the north. The distance between Christiania and Harstad, which is situated somewhat to the south of Tromsö, is about 500 miles. The main line to Tromsö will be completed in the near future, and be opened for the use of the public.

Postal Servants.—On Tuesday the National Joint Committee of the Postal and Telegraph Servants was received by the Postmaster-General to discuss the position raised by the Holt Committee's report. The interview was private, but Mr. Samuel will grant the Committee a further interview on November 13th, at which a public statement will probably be made.

Telephone Rentals.—At the Dublin Court of Appeal last week it was decided that the Crown was entitled, in the case of bankruptcy, to recover the full amount of telephone rentals payable under agreements made between bankrupts and the National Telephone Co., as the Crown was not bound by the Bankruptcy Acts.

The Telephone Service.—Mr. Herbert Samuel on Monday said that he had come to the conclusion, after making some study of the telephone services in Chicago, New York, and Seattle, and in several of the towns in Canada, that their telephone service was distinctly more efficient than our service in this country was as yet—not, he believed, than our service would be. This country was ahead of the United States in the development of the automatic telephone service, and contracts for exchanges of the total value of nearly £100,000 were being placed.

Trans-Atlantic Wireless Telegraphy.—The Marconi Co. announces the inauguration of the duplex system between Canada and Ireland.

World Wireless.—It is announced that a scheme for the encircling of the world by a chain of wireless stations is in course of development by the Marconi Co.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney (New South Wales).—March 18th, 1914.—For the Postmaster-General. Seven automatic switchboards. Schedule No. 179. See "Official Notices" October 31st.

December 14th.—Two sections switchboard, common-battery multiple. See "Official Notices" October 17th.

Hobart (Tas.).—December 1st. Dry cells for the P.M.G. See "Official Notices" October 17th.

Brisbane.—December 17th. P.M.G.: Insulators. See "Official Notices" October 31st.

December 31st. P.M.G. Insulators. See "Official Notices" October 31st.

December 22nd. Melbourne Suburban Railways. (1) Track feed boxes, including signal transformers, switchgear and accessories. (2) Track resistances. (3) Impedance bonds. (4) Track relays and relay boxes. Specifications (£5 5s.) from Agent-General for Victoria, on or after November 10th. Consulting engineers, Messrs. Merz & McLellan, 32, Victoria Street, S.W.

Austria.—Lemberg.—November 17th. Tenders are required for the following mechanico-electrical machinery for (1) the Royal railway erection shops at Lemberg:—Form A: One 90-ton locomotive turn-table, rails (12 m. long) electrically driven; one 80-ton electric travelling crane, with two 40-ton motor-travelling screw jacks, capable of raising and transporting locomotives complete; one electric three-motor 3-ton erection travelling crane; two three-ton and 5-ton two-motor travelling screw-jacks for hanging railway; one electric light and power three-phase (220-volt, 50 periods per second) installation. (2) For the smiths' shop, Form B: One electric three-motor travelling crane, 6 tons capacity, with transmission lines. (3) For the tool-making shop, Form C: One gas-tempering stove, with accessories. (4) Form D: Locomotive wheel-making arrangement, with electric equipment for constant current at 300 volts. Particulars, drawings, &c., as per Forms A, B, C and D, from Abteilung für den Zugförderungs und Werkstattendienst, K K. Staatsbahndirection, Lemberg.

Beckenham.—November 10th. U.D.C. 12 months' supply of Midland Small Coal. See "Official Notices" October 31st.

Bedford.—November 12th. Corporation. (1) 1,000-kw. mixed-pressure turbo-alternator with exciter and condensing plant; (2) water-tube boiler with mechanical stoker and coal-handling plant. See "Official Notices" October 24th.

Belgium.—December 1st. The municipal authorities of Neufchateau are inviting tenders until December 1st for the concession for the electric lighting of the town.

January 26th. Six electric cranes on the Bassin-Canal extension. Tenders to Burgomaster, Hôtel de Ville, Antwerp. Deposit £800. Some particulars in French can be seen at Board of Trade C.I. Department in London.

Bournemouth.—November 17th. Corporation: Ten bogie electric tramcars.

Bradford.—November 15th. Electrical installation, Technical College, for the Education Committee. City Architect, Town Hall.

Canary Islands.—November 28th. The Spanish Post and Telegraph Authorities in Madrid are inviting tenders for the concession for the working of the telephonic system in the town of Las Palmas, Canary Islands, belonging to the State during a period of 15 years.

Dublin.—November 17th. Twelve months' supply of stores, for Dublin Tramway Co., Ltd. See "Official Notices" October 31st.

(*Continued on page* 751.)

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Next week the new session of the Institution will commence in London—at several of the provincial centres it has already been opened. Some indication of the features which will probably mark the proceedings may be gathered from the chairmen's addresses and the official programme.

The former strongly reflect the policy of the "broader view" inaugurated by Dr. Ferranti, by their references to the non-technical interests of the Institution and its members, and this feature was emphasised in the speech of the President, Mr. Wm. Duddell, at the annual dinner of the Western Local Section the other day. It seems clear that the Institution has felt impelled—whether by the merits of the question or by the formation of new societies outside the Institution—to give serious consideration to the status and salaries of its younger members. Another point to which the chairmen have referred is the coming electrification of our railways, and though the conversion of the main lines may still be somewhat remote, their remarks on the subject clearly indicate their conviction that it will not be long delayed, and that when it does arrive it will prove of the utmost importance to the electrical industry in this country.

That this view is shared by the Council of the Institution is abundantly manifest in the programme for the second half of the session in London, which contains no fewer than eight papers on subjects connected with the electrification of railways. Whether so large a dose of one special kind of medicine will be relished by the members may be open to question, but it leaves no doubt as to the Council's views on the tendency of the times, and we trust that the papers and the discussions thereupon will bring forth an abundant store of information from those best qualified to speak, which will aid in the accomplishment of the huge task which lies before our engineers. There is probably no other country in the world where the railway traffic is so dense, the runs comparatively so short, and the prospects of a good return on the outlay required for the conversion of the railways so favourable. The resurrected feud between A.C. and D.C., unfortunately, may cause delay, as it has already done, but we hope that a way will be found, in the interests of the whole community, as well as of the electrical industry, to overcome this obstacle. The question is of so much importance that it would afford ample justification for the appointment of a Royal Commission to inquire into the merits of the rival systems. The adoption of common standards for main-line work is undoubtedly a matter of the first importance.

We published portraits and biographical sketches of Mr. Duddell, who has been elected for a second year of office as President, and Mr. A. M. Taylor, Chairman of the Birmingham Local Section, in our issue of November 8th last year. Below we give some notes on the careers of the new Chairmen of Local Sections.

Mr. Chas. Vernier, M.I.E.E., who is this year's chairman of the **Newcastle-on-Tyne Local Section,** was born in London in 1877. His early technical education was received at the Regent Street Polytechnic, but at the age of 14½ he commenced a three years' apprenticeship with Messrs. Reyrolle, then located in London. During these and subsequent years, Mr. Vernier continued his studies both at the Polytechnic and the City and Guilds Institute, Finsbury, being a bronze medallist in electrical engineering in connection with the former institution in 1894, whilst he also passed the Honours grade in the same subject, in connection with the last-named college, in 1896.

In that year Mr. Vernier was appointed electrician to the Brockie-Pell Arc Lamp Co., with whom he remained for two years, and subsequently, in a search for further experience, and upon the recommendation of Mr. Reyrolle, was appointed by Mr. Charles H. Merz, who was then chief engineer of the Cork Electric Tramways and Lighting Co., an assistant engineer with that company, for whom he supervised the relaying of the cable network and the installation of public street lighting in the City of Cork from June, 1899, to the end of 1900.

Mr. Vernier was then offered an appointment with the Newcastle Electric Supply Co., Ltd., to supervise the laying of the distributing networks in Newcastle and district, and for the past 13 years has been responsible for the bulk of this work in connection with the company's operations.

As our readers are, no doubt, aware, Mr. Vernier's experience in the matter of cables, both underground and overhead, is unique in this country; he controls the whole of the cable work connected with his own and allied companies, which includes some 40 distributing networks.

He was elected an Associate Member of the Institution of Electrical Engineers in 1904 and a Member in 1911, and contributed a paper to the Institution in 1911 on the "Laying and Maintenance of Transmission Cables"; his address as chairman of the Section was reprinted in abstract in our last issue.

Mr. William B. Woodhouse, M.I.E.E., chairman of the **Yorkshire Local Section,** was trained at the Finsbury Technical and University Colleges, London, subsequently serving an apprenticeship with the India-Rubber, Gutta-Percha and Telegraph Works Co., at Silvertown. A varied engineering experience included his return at a later date to Finsbury as a lecturer. In 1901 he was engaged at Wallsend in the development of the Newcastle-on-Tyne Electric Supply Co.'s power scheme, which was the first of its kind in this country, and two years later he was appointed manager of the Yorkshire Electric Power Co., the development of which undertaking has thus been under his control for 10 years. Mr. Woodhouse is also engineer and manager of Electrical Distribution of Yorkshire, Ltd., a company working 15 electric lighting undertakings, and of the Yorkshire Waste Heat Co., whose first waste heat station has recently been set to work, both these companies being intimately associated with the Power Co.

Mr. Woodhouse has contributed greatly to our understanding of the problems of electricity supply to the textile industries, which bulk so largely in the extensive area covered by his company. He is the author of various papers of engineering interest, and as an engineer he probably has a wider knowledge of electricity supply in Yorkshire than the great majority of his colleagues in the same industry.

Mr. H. Faraday Proctor, M.Inst.C.E., M.I.E.E., the well-known city electrical engineer of Bristol, is this year's chairman of the **Western Local Section,** in the formation of which last year he took a leading part.

Mr. Proctor hails from Tyneside; he was born in Newcastle-on-Tyne in 1867, and spent the first 25 years of his life in the neighbourhood—this period including his engineering apprenticeship with Messrs. Henry Watson & Sons, and training at the Armstrong College.

Leaving the above firm some time after the completion of his apprenticeship, Mr. Proctor joined the Newcastle-on-Tyne Electric Supply Co. as assistant engineer, remaining there until the close of 1892, when he took up his present appointment as chief engineer and general manager of the Corporation Electricity Department, Bristol.

It will be seen that Mr. Proctor has had charge of the Bristol undertaking from the very commencement, but his connection with municipal work has meant far more than 21 years of Corporation service, as he was one of the founders of the Incorporated Municipal Electrical Association, and is, in fact, the only representative who has been a member of the Council of that body continuously since it was formed some 18 years ago.

Mr. Proctor was President of the I.M.E.A. in 1898-9, and has been an indefatigable Hon. Secretary during the last eight years; he was also elected a Member of Council of the I.E.E. in 1910, being the first to be so elected by the general body of the members of the Institution.

Mr. J. A. Robertson, M.I.E.E., who is the new chairman of the **Scottish Local Section,** is the Consulting and Resident Engineer to the Burgh of Greenock. His earlier experience was obtained with the Stirling Corporation and with Messrs. Denny Bros., the Dumbarton shipbuilding and engineering firm.

During his 11 years' stay in Greenock he has been responsible for the erection of the Dellingburn power station and refuse destructor, and has introduced the three-phase

CHAIRMEN OF I.E.E. LOCAL SECTIONS.

CHAS. VERNIER, NEWCASTLE.

E. W. MARCHANT, MANCHESTER.

J. A. ROBERTSON, SCOTTISH.

Photo. by [*Protheroe, Bristol.*

H. FARADAY PROCTOR, WESTERN.

Photo. by [*Bacon & Sons, Leeds.*

W. B. WOODHOUSE, YORKSHIRE.

H.T. supply with sub-stations on consumers' premises. As our readers are aware, the Greenock electricity department has gone ahead very rapidly of late, and practically all the large works take their whole supply for both power and lighting from the Corporation; in fact, the "units sold per head of population" in Greenock are about the highest in the country. The latest development is, of course, the extended supply to Port-Glasgow, where seven shipbuilding firms have become large consumers, whilst the provisional order for the area will also be worked by the Greenock authorities.

Photo. by] *[Norman Dewar, Dublin.*

G. M. Harriss, Dublin.

Mr. Robertson is consulting engineer to several other Scottish burghs, and has contributed several papers to the *Proceedings* of various engineering societies.

Prof. E. W. Marchant, D.Sc., M.I.E.E., the chairman of the **Manchester Local Section,** and David Jardine Professor of Electrical Engineering at the Liverpool University, was born in 1876. He graduated in London, taking honours in both mathematics and physics, and was awarded the Granville Scholarship at the D.Sc. examination. On leaving college, Prof. Marchant served a works apprenticeship, and subsequently held the position of superintendent of the Blythswood Laboratories, Renfrew, N.B.

After a brief period at the Finsbury Technical College in 1901, he was appointed lecturer in Electrotechnics at University College, Liverpool, and is the first holder of the chair of Electrical Engineering at the University, which was founded in 1903 through the generosity of Mr. David Jardine.

Prof. Marchant has contributed numerous papers to the *Proceedings* of the Institution of Electrical Engineers and other scientific societies; it is interesting to note that he was associated with Mr. Duddell, President of the Institution, in the development of the oscillograph. Recently he has interested himself in wireless telegraphy, an excellent equipment having been provided at Liverpool University.

Mr. Geo. Marshall Harriss, M.Inst.C.E.I., M.I.E.E., who has been elected chairman of the **Dublin Local Section,** is an engineer of wide experience both in this country and abroad. Originally a pupil of Mr. Thomas Tomlinson, he accompanied that gentleman to Queensland in 1884, and was engaged at Messrs. Babbidge's and the Queensland Railway Carriage Works; subsequently he superintended the erection of the first quartz-crushing plant on the Croydon goldfield.

Returning to England in 1891, he joined the staff of Messrs. J. E. H. Gordon & Co. as outdoor assistant on the works of the Crystal Palace District electricity supply station. He afterwards became resident engineer of the Bray electricity works, and was appointed township electrical engineer in 1896, upon the purchase of the undertaking by the Bray Commissioners. He retained this position until 1900, when he accepted an appointment with Prof. George Forbes to act as that gentleman's representative in Ireland, and resident engineer to the Carlow Electrical Works, where he had a fairly extensive practice as consulting engineer, principally in connection with the development of water powers for electrical work. Mr. Harriss acted as resident engineer to the Irish International Exhibition throughout its run, and afterwards joined the staff of Mr. W. M. Murphy on railway construction in the Gold Coast Colony, taking charge of the first 20-mile section of the Accra Akwapim Railway, which included the laying-out of the Accra terminus, all the buildings, and the erection of the telegraph and block system of signalling throughout.

After two years in West Africa he was appointed electrical engineer to the Dublin United Tramway Co., which position he still holds. He is the author of papers on the lighting of small towns, railway construction in West Africa, &c.

Sir Joseph Swan, F.R.S.—The Electrical Review tenders its heartiest congratulations to Sir Joseph Swan, F.R.S., on the occasion of his eighty-fifth birthday. Notwithstanding his great age, Sir Joseph's interest in scientific pursuits in his laboratory at Warlingham, Surrey, shows no languishing. For a full account of this famous electrical veteran's career and his many inventions, we refer our readers to our issue of November 24th, 1904.

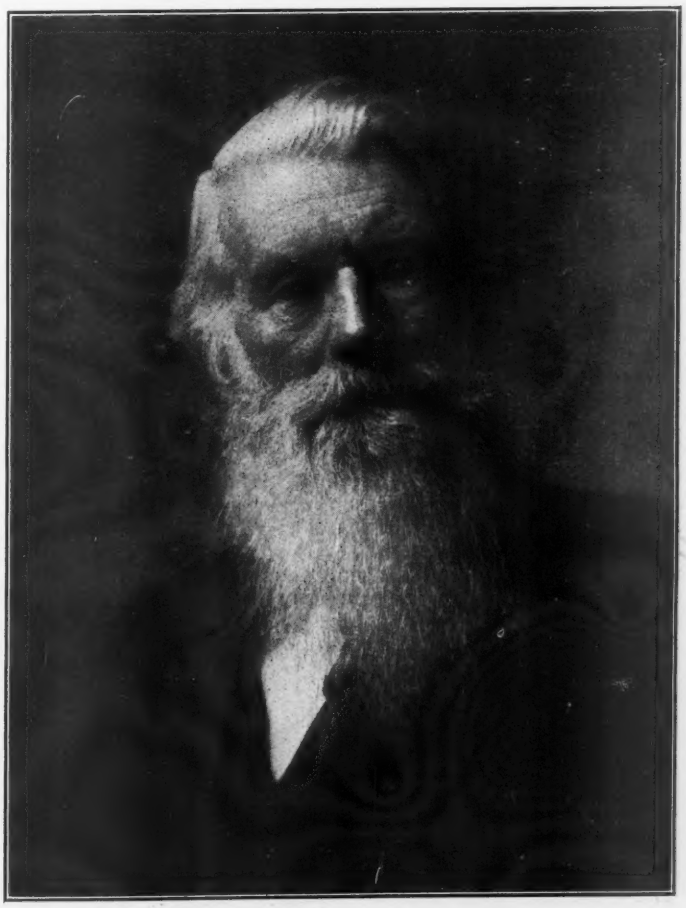


Photo by] *[Swaine.*

Joseph W. Swan

THE STERLING TELEPHONE CO.'S NEW OFFICES.

The removal of the Sterling Telephone and Electric Co., Ltd., from Upper Thames Street to Tottenham Court Road, marks the accomplishment of a further stage in the career of this prosperous concern, regarding which a few particulars may be of interest to our readers. From the commencement the company has confined its attention exclusively to telephones, bells and allied apparatus, including magneto exploders, and has hammered away steadily at this class of business without yielding to the temptation to widen the scope of its operations, with the result that it has gained a position in the front rank of the telephone industry of this country.

Public Office of the Sterling Co.

Showroom at Telephone House.

The credit for the remarkable progress made by the company and the high reputation of its products is due entirely to the founder and managing director of the company, Mr. Guy Burney, though he would be the last to claim it for himself, alleging that the success which has been attained is due to the loyalty of a devoted and proficient staff. Mr. Burney, while describing himself as a commercial engineer and not a telephone expert, nevertheless possesses an intimate and exhaustive knowledge of every phase of the telephone industry apart from public exchange installations, with which his company has not concerned itself, and combines with his technical ability a commercial acumen which enables him to gauge correctly the tendency of the moment, and to forecast the needs of the future.

The company sprang from very modest beginnings; it was established in London as an off-shoot of the Berliner Telephone Works, in 1900, the offices being situated in Queen Victoria Street: larger accommodation soon became necessary, and in 1904 new offices and a warehouse were taken in Upper Thames Street. The development of the business rendered it necessary to increase the capital and extend the range of activity of the firm, and therefore it was converted into a private limited liability company in 1909.

Mr. Burney had always cherished the hope of establishing works in this country, and under the new conditions he was able to realise this laudable ambition; before the end of the same year (1909) a large factory at Dagenham had been equipped with plant for the manufacture of telephones, &c., and was soon in full swing. Last year we paid a visit to the Dagenham works, which by that time had been very considerably extended beyond their original capacity, and in our issue of April 12th, 1912, we published a fully illustrated description of the factory. Large orders for the British and Colonial Governments have been carried out or are now in progress at these works, which also turn out a great variety of telephones, &c., for domestic, office and workshop use.

The last-named branches have, in fact, formed the foundation of the company's business, for it was by the adaptation of existing patterns of telephones to suit English conditions that Mr. Burney succeeded in popularising the telephone and creating a demand for instruments for domestic use. The company has led the way in this branch of industry by introducing many novel features, and has done a great deal towards developing the domestic market, which was previously almost non-existent. In particular, it claims to have been the first to put on the market in commercial form an intercommunication telephone with multiple levers and interlocking movements, a pattern which has proved exceedingly popular, and has been very widely adopted.

The Sterling Co., however, has confined its attention wholly to the manufacture and supply of its apparatus; it has never undertaken to carry out any installation work, but has loyally supported the contractor, rigidly refusing to grant any discount whatever except to trade customers. In this respect the company sets an excellent example to all manufacturing concerns; it is well known that failure to observe this rule has led to incessant disturbance and bitter feuds in the various trades from time to time.

The object of the new establishment, with its extensive range of show-windows and showroom, is to popularise the telephone by bringing it directly under the notice of the public; and in this respect the permanent exhibition of apparatus which has been organised by the company at

Repair Shop.

the new Telephone House is admirably calculated to achieve its purpose.

The display in the windows is so striking that it cannot fail to attract the attention of the passer-by; and the showroom presents an extraordinary variety of apparatus, mounted on a novel background which sets off the finish of the instruments to great advantage. The lighting of the windows is an object lesson in the art. The company claims that the exhibit is unique in Europe, and we have no doubt that its claim is justified.

With many of the patterns exhibited in the showroom, our readers are already familiar; others are not yet ready for publication, but we may draw special attention to a complete new range of ferrocased telephones, the cases being of drawn steel, which present an exceptionally handsome appearance, besides being compact and robust. These are made throughout at the Dagenham Works, as indeed are nearly all the instruments exhibited; the necessary tools are now being made for the remaining patterns, and in the course of a few months the whole of the company's apparatus will be made at Dagenham.

The company is not content with the present achievements; Mr. Burney is convinced that there is still an enormous scope for the development of the domestic telephone —not only the Parlyphone, which is so easily installed on any existing bell circuit, but also the more elaborate and expensive patterns of intercommunication telephone, &c.— and he is determined to prosecute his campaign in this field. One of the greatest obstacles to success in this connection is the present attitude of the telephone authorities in this country, in striking contrast to that of the German officials. Here, the Post Office will not permit any apparatus whatever to be connected with its exchanges except those which it supplies, whereas in Germany, provided that the pattern has been approved, private intercommunication telephone systems are commonly connected directly with the exchange system, so that a subscriber can not only communicate with any of his own stations without the aid of an operator, but can also get through to any other subscriber on the Government system. Difficulties have, of course, been met with in devising suitable apparatus, but these have been completely overcome, and in point of fact the system is very widely used in Germany, where it is very popular and is, of course, approved by the Government. We need not here go into the details of the apparatus employed; suffice it to say that it is efficient and adequate for all the requirements, and that the British Post Office telephone authorities have been kept acquainted with its development and progress, but that they still decline to permit any instruments to be used on exchange circuits except their own stereotyped patterns.

We cannot believe, however, that this reactionary attitude can prevail for long, in view of what has been done abroad; the Postmaster-General, Mr. Herbert Samuel, is probably the most efficient and progressive Minister who has ever occupied that office, and has repeatedly expressed his determination to press on the popularisation of the telephone service in every possible way. It may be that under the stress of making up for the time lost through the transfer of the system to the State, the staff has not been able as yet to contemplate the further development of facilities for using the service; but there is no doubt that they must come sooner or later, and the sooner the better.

We give some views of the new offices, showroom and repair shop at Telephone House, which have been fitted out with excellent judgment and good taste; the establishment also comprises large store-rooms, packing rooms, &c., and repair shops, enabling special work to be done without the necessity of reference to the Dagenham Works. We may conclude with the suggestion that Telephone House is worth a personal visit, if only to see how office work is facilitated by the complete and costly installations of intercommunication telephones, pneumatic tubes, good lighting (the semi-indirect illumination is not only exceptionally satisfactory, but has been found more economical than direct lighting), and efficient organisation.

Lamp Making in Austria.—The Watt Elektrische Gluhlampenfabrik Gesellschaft is the name of a new company which has just been formed in Vienna, with a capital of £80,000, to acquire and carry on the Watt electric lamp works in the city.

GLASGOW ELECTRICAL EXHIBITION.

In addition to the firms named in our last issue as displaying manufactures at this Exhibition the following call for mention:—

At Stand 32, Messrs. A. Schonfield & Co. of Glasgow, are showing a large variety of their patent hygienic Hestia stoves, which they guarantee for five years, and which are supplied in 1, 2 and 3 units. These stoves are being exhibited in conjunction with their automatic temperature control device (Grundy system) for the automatic control of temperature in rooms. This system can also be applied to gas and steam heating. The saving claimed to be effected by means of this apparatus is 70 per cent. Installations of this heating system have been carried out for H.M.'s Offices of Works and other large concerns.

Messrs. Thomas Kesnor & Co., Ltd., of Watford, have an exhibit at Stand No. 51, which chiefly consists of electric motor control apparatus, more particularly of the automatic type, including the well-known Kesnor patent elevator controller, service controller for dinner lifts, &c., car switches, push buttons, limit and direction switches, gate locks, door contacts, &c. A special feature is their new automatic motor starter. Messrs. Kesnor also exhibit their ticket-issuing machines for picture theatres, equipped with electric counters, which can be fitted in the manager's office or other convenient position outside the pay box.

Messrs. Watson & Whyte, of Glasgow, have a stand whereon they are displaying the manufactures of the Crypto Electrical Co., the British L.M. Ericsson Manufacturing Co., Ltd., and Messrs. John C. Fuller & Sons, Ltd., for whom they are sole agents in Scotland.

Messrs. Ross & Co., of Glasgow, are showing incandescent lamps, cooking and heating apparatus, &c.; the Scottish Vacuum Cleaner Co., of Glasgow, exhibit vacuum cleaners; Messrs. Thomas and Bishop, of London, show their Cling-surface for belts, Permac commutator compound, &c.; the Telephone, Lighting and Power Co., of Glasgow, have an exhibit of telephones on view; Messrs. Wood & Cairns, Ltd., Edinburgh (agents for the Electrical Co., Ltd.), have a comprehensive exhibit of motors, dynamos, switchgear, heating and cooking apparatus, electric signs, clocks, &c.

The British Electric Heater Co., Ltd., Glasgow, exhibit electric geysers, electrically-heated towel rails and bath tanks; electric signs are shown by Messrs. Forrest & Sons, of Anderston; Messrs. E. H. Judd & Co., of Glasgow, show starters, controllers, &c., the manufactures of Messrs. Brook, Hirst & Co., Ltd., and Allen, West and Co., for whom they are sole agents in Scotland; the Jandus Arc Lamp and Electric Co., of London, exhibit their arc lamps; Messrs. Kelvin, Bottomley & Baird, Ltd., Glasgow, have an interesting collection of electric heaters and radiators, electrically-heated table plate, electric tea and coffee pots, toasters, irons, &c.; Messrs. Le Carbone, with dynamos and motor brushes, and the Nicholson and Clipper Co., Ltd., of Manchester, with belt fasteners, patent locking lampholders, girder clips, &c., complete the list.

CONTRACTS OPEN.

(*Continued from page 746.*)

France.—November 15th. The French Post and Telegraph Authorities in Marseilles (Rue Colbert) are inviting tenders for an installation of semi-automatic telephones at the General Post Office in Marseilles.

November 15th. The Municipal Authorities of Compiègne (Oise) are inviting tenders for the supply of a reserve steam engine and dynamo of a capacity of 120 KW. for the local water pumping station.

Grimsby.—November 13th. Corporation: Metal-filament lamps; ½ to 15 H.P. continuous-current motors; ½ to 15 H.P. motor panels; house fuse boxes and fittings; house service boxes (lead) and fittings. See "Official Notices" October 31st.

November 13th. Fine slack coal (about 11,000 tons), for the Corporation Electricity Works; Mr. W. A. Vignoles, electrical engineer.

India.—ALLAHABAD.—Electric generating plant, consisting of oil engines, continuous-current dynamos and storage batteries. Hon. Sec., Allahabad Club, Ltd., Allahabad.

London.—November 12th. L.C.C. (1) Installation at Colebrook Row Special School, Islington, N. 95 lighting points; (2) installation at County Secondary School, Chelsea, 180 lighting points. See "Official Notices" October 24th.

BATTERSEA.—November 13th. Corporation: Wiring of shop premises in connection with hire scheme, for one year. See "Official Notices" to-day.

HAMMERSMITH.—November 14th. Corporation: Arc lamps for fixing on consumers' premises, to work two in series on single-phase A.C., 50 periods, 110 volts. See "Official Notices" to-day.

L.C.C.—November 26th. Installation, 140 lighting points, at Hammersmith Trade School for Girls, Lime Grove. See "Official Notices" to-day.

(*Continued on page 752.*)

Manchester.—November 28th. Corporation. Two water-tube boilers and superheaters, economisers, coal chutes, ash conveyor, pipe connections, additional stoker shafting and clutches, and pneumatic ash-handling plant at boiler house No. 2, Stuart Street generating station. See "Official Notices" to-day.

New Zealand.—January 5th, 1914. The Christchurch City Council invites tenders for series street-lighting plant (1,950 metallic-filament lamps) and accessories. A specification can be seen at the B. of T. C.I. Department in London.

Rainhill (near Liverpool).—November 24th. Wiring and fittings for new ward, Lancashire County Asylum. See "Official Notices" to-day.

Rhyl.—November 19th. One 160-KW. Diesel engine set, for U.D.C. See "Official Notices" October 17th.

Spain.—The municipal authorities of Zumaya (Province of Guipuzcoa) have just invited tenders for the concession for the electric lighting of the town during a period of 16 years.

November 17th. Tenders are being invited by the Spanish Post and Telegraph authorities in Madrid, for the concession for the working during a period of 15 years of the telephonic system in the town of Toledo, belonging to the State.

November 18th. The municipal authorities of Chamartin de la Rosa (province of Madrid) are inviting tenders for the concession for the electric lighting of the town during a period of six years.

November 18th. The Spanish Post and Telegraph authorities in Madrid are inviting tenders for the concession for the working during a period of 15 years of the telephonic system in the town of Alcoy (province of Alicante), belonging to the State.

Swansea.—Harbour Trust. Three portable hydraulic or electric cranes, fixed jibs, and three with jibs fitted with compensating luffing gear. Deposit £3 3s. Mr. T. Strick, Clerk, Harbour Offices.

The Azores.—January 12th. La Junta Generale du District de Ponta Delgada, Saint Michel, Azores, is inviting tenders for the construction and working of an electric railway between Ponta Delgada and Valle das Furnas, and between Ponta Delgada and Villa da Ribeira Grande. The lines will be laid at the side of the national and municipal roads.

Wakefield (Yorks.).—December 5th. Twelve months' supply of stores, for Yorkshire (West Riding) Electric Tramways Co., Ltd.

Warrington.—November 14th. Telegraph materials and carbons for a year, for the Cheshire Lines Committee. Stores Superintendent, Cheshire Lines, Warrington.

Wolverhampton.—November 9th. Corporation: One 4,000-KW. turbo-alternator, condensing plant, and auxiliaries.

CLOSED.

Australia.—Home Affairs Department:—

Generating plant at North Head Quarantine Station, Sydney, £1,404.—G. Weymouth Pty., Ltd.

External Affairs Department:—

Electric light apparatus, for N. Territory, £880.—Siemens Bros.—*Tenders*

Bacup.—The Electricity and Tramways Committee has accepted the tender of the Expanded Metal Co., Ltd., for expanded metal screen, suggested by the L.G.B. Inspector at the Stacksteads sub-station.

Belgium.—Five concerns—three German, and one each Belgian and French—submitted tenders last week to the Municipal authorities of Ixelles, Brussels, for the supply of a quantity of armoured low-tension cable, the lowest offer being that of the Société A.E.G. Union Electrique, of Brussels.

Canada.—OTTAWA.—The contract has been awarded the Canadian General Electric Co., Ltd., by the Ottawa and Hull Power and Manufacturing Co., for two water wheel type alternators each of 6,750 K.V.A., 120 R.P.M., 2,300 volts and also for two transformers, each of 6,750 K.V.A., 2,300/12,000 volts.

WINNIPEG.—The contract has been awarded Messrs. C. H. Simpson & Co., for the power house and heating plant of the new Parliament buildings.—*Canadian Engineer.*

Constantinople.—The Aster Engineering Co. has lately received an order for a batch of four-cylinder 14-H.P. marine engines to temporarily drive dynamos by belts, and subsequently be installed in boats.

Ipswich.—The Corporation contract for meters for 10 amperes and upwards has been received by Messrs. Chamberlain and Hookham, Ltd.

Leigh.—November 20th. Supply of coal (approximately 4,000 tons) for the electricity works for a year. Particulars from Electrical Engineer, Albion Street, Leigh.

Leyton.—The following tenders have been received by the U.D.C. for the supply of 1 mile of '05 single-core cable:—

R. R. Todd .. .. (accepted)	£130	Siemens Bros. & Co.	£152
Western Electric Co.	135	General Cable Mfg. Co.	160
Standard Cable Mfg. Co.	136	W. T. Glover & Co.	160
W. T. Henley's Co., Ltd. ..	145	Electrical Eng. and Equip. Co.	169
B.I. and Helsby Cables, Ltd. ..	146	Connolly Bros., Ltd.	196
Union Cable Co., Ltd.	146	Pirelli, Ltd.	210
Johnson & Phillips, Ltd.	150	General Electric Co.	210
Callender's Cable, &c., Co. ..	150		

Limerick.—The Corporation has placed an order with the Premier Accumulator Co., Ltd., for a battery, booster, balancer, switchboard and milking booster, &c.

Lisnaskea.—The order for the switchboard for the electricity works at Lisnaskea, Ireland, has been placed with the Walsall Electrical Co., Ltd.

London.—BERMONDSEY.—The following tenders have been received by the Borough Council for a supply of feeder panels:—

	£ s.		£ s.
Universal Electrical Co. (accepted)	97 10	Johnson & Phillips, Ltd. ..	141 0
Record Electrical Co. (voltmeters £2 10s. each extra) ..	104 5	Electrical Apparatus Co. ..	168 0
Eckstein, Heap & Co., Ltd. ..	123 0	Crompton & Co. (voltmeters £2 7s. each extra)	171 0
General Electric Co.	125 0	Siemens Bros.	172 0

The Council has also accepted a quotation from the Reason Manufacturing Co., Ltd., for demand indicators for feeder pillars.

SOUTHWARK.—The B.C. has accepted the tender of Alfred Blackmore & Co. for a supply of 6,000 tons of coal to the electricity station, at 14s. 3d. per ton, and 6,000 tons, at 13s. 9d. per ton.

L.C.C.—The Highways Committee has accepted the tender of the Société Anonyme Usines et Aciéries, of Allard, Belgium, for the supply of 200 cast-steel driving wheel centres for electric cars at £1 4s. 6d. each.

The Committee also accepted the tender of Messrs. Pinchin, Johnson & Co., Ltd., for 500 gallons of a special heat-resisting grey enamel for treating plough bases, at 8s. 6d. per gallon. Experiments made with this enamel proved very satisfactory, and it is the Committee's opinion that all the plough bases in use should be treated with it at the earliest possible moment, particularly in view of the approaching winter.

The Metropolitan Asylums Board has accepted the tender of the Electric Contracts and Maintenance Co., at £32 10s., for the installation of temporary fire alarm and telephone systems at the Lower Southern Hospital.

HAMMERSMITH.—In connection with the construction and erection of the coal storage and transportation scheme, the Electricity Committee recommends the acceptance of the following tenders:—

J. Mowlem & Co.—For construction of five coal storage tanks, £10,393.
Fraser & Chalmers.—Coal hoppers, weighing machine, and mixing tank at Chancellor's Wharf, £658.
Gwynnes, Ltd.—Pumping plant at Chancellor's Wharf and electricity works, £922.
Fraser & Chalmers.—Electric crane, rail track and conveying plant, £2,429.
British Mannesmann Tube Co., Ltd.—Pipe work, jointing material, &c.

The B.C. Electricity Committee has accepted the tender of Messrs. W. Cory & Son for the supply of Seven Sisters hard dry coal for the electricity works, at 12s. 9d. per ton.

Maidenhead.—The T.C. has accepted the tender of the the Crynant Colliery Co. for 1,000 tons of coal for the electricity works, at £1 1s. 4d. per ton.

Manchester.—The Electricity Committee has accepted the following tenders:—

E. Green & Sons, Ltd.—For renewal and replacement work to economisers at Blcom Street Station.
The British Thomson-Houston Co., Ltd.; the Brush Electrical Engineering Co., Ltd.; and Siemens Bros. Dynamo Works, Ltd.—For requirements of lamps during the period ending June 30th, 1914.
E. Cleaton Rees & Co. and the Vacuum Oil Co., Ltd.—For supplies of transformer and colza oil for the period ending June 30th, 1914.
Ferranti, Ltd.—For H.T. switchgear.
Johnson & Phillips, Ltd.—For supply of cable.

The Committee has accepted the offer of the Keighley Corporation for the purchase and removal of a 150-KW. motor generator.

The Education Committee has accepted the tender of Messrs W. P. Theermann & Co., Ltd., for electric light installation at the Municipal School of Domestic Economy.

The Paving, &c., Committee has accepted the tender of Messrs. E. M. Evans & Sons for the supply and fixing of the necessary cables, wiring and lamps for the electric lighting of the new offices at Great Bridgewater Street Yard.

Skipton.—The contract for the electric work at the new Premier Picture Palace has been secured by Messrs. H. Green & Co., Cononley.

Wimbledon.—The B.C. has accepted the tender of the Foster Engineering Co., Ltd., at £62, for the supply of a 75-KW. electric transformer, also the tender of the British Electric Transformer Co., Ltd., at £52 12s. 6d. for a 50-KW. transformer.

FORTHCOMING EVENTS.

Manchester Society of Model Engineers.—Thursday to Saturday, November 6th to 8th. Exhibition of Engineering Models. At Coal Exchange, Market Place.

Institution of Municipal Engineers.—Friday, November 7th. At 2.45 p.m. At 4, Southampton Row, W.C. Presidential address, by Mr. Horace Boot (President Elect), not by Mr. F. Latham, the present president, as stated in our last issue. Paper on "Electricity as a By-Product," by Mr. R. J. Spencer-Phillips.

Junior Institution of Engineers.—Friday, November 7th. At 8 p.m. At 39, Victoria Street, Westminster. Paper on "Experience in the Design, and Working on Different Kinds of Fuel, of Gas Producers," by Mr. G. E. Lygo.

Manchester Association of Engineers.—Saturday, November 8th. At Grand Hotel, Aytoun Street. Paper on "Recent Developments in Steam Condensing Plants," by Mr. A. E. Leigh Scanes.

Institution of Electrical Engineers (Newcastle Local Section).—Monday, November 10th. At 7.30 p.m. At Armstrong College. Paper on "Steam Boiler Working in Electrical Power Stations," by Mr. J. W. Jackson.

Institute of Marine Engineers.—Monday, November 10th. At 8 p.m. Fuel Test.

Institution of Mechanical Engineers (Graduates' Association).—Monday, November 10th. At 8 pm. Paper on "Modern Methods of Steam Raising," by Mr. R. D. McGroarty.

Institution of Post Office Electrical Engineers.—Monday, November 10th. At 6 p.m. At Institution of Electrical Engineers, Victoria Embankment, W.C. Paper on "Telephone Engineering Economics," by Mr. H. A. Smith.

Institution of Electrical Engineers (Scottish Local Section).—Tuesday, November 11th. At 8 p.m. At 207, Bath Street, Glasgow. Ordinary meeting. Address by Mr. J. A. Robertson.

Association of Engineers-in-Charge.—Wednesday, November 12th. At 7.45 p.m. At Marconi House, Strand, W.C. Paper on "Wireless Telegraphy," by Capt. H. Riall Sankey.

Diesel Engine Users' Association.—Wednesday, November 12th. Ordinary meeting.

Faraday Society.—Wednesday, November 12th. At Burlington House, W. 4.30 p.m., Tea; 5 p.m., Papers on "Passivity of Metals"; 6.30 p.m., Dinner at Trocadero; 8 p.m., Reading of Communications in abstract, followed by discussion.

Concrete Institute.—Thursday, November 13th. At 7.30 p.m. At 296, Vauxhall Bridge Road, S.W. Presidential Address by Mr. E. P. Wells.

Institution of Electrical Engineers.—Thursday, November 13th. At 8 p.m. At the Institution, Victoria Embankment. Address on "Pressure Rises," by Mr. W. Duddell, F.R.S.

Greenock Electrical Society.—Friday, November 14th. Paper on "Electric Tram-Car Equipment," by Mr. S. James, and visit to depôt.

Junior Institution of Engineers.—Friday, November 14th. At 8 p.m. At Victoria Station Restaurant. Smoking Concert. Saturday, November 15th. At 3 p.m. Visit, Saltley Gas Works, Birmingham.

Northampton Engineering College Engineering Society.—Friday, November 14th. Discussion on "The Future Sources of Energy."

Physical Society of London.—Friday, November 14th. At 8 p.m. At Imperial College of Science, S.W. Papers on "Thermal Conductivity of Mercury by the Impressed Velocity Method," by Mr. H. R. Nettleton, B.Sc. "Polarisation and Energy Losses in Dielectrics," by Mr. A. W. Ashton, D.Sc. A Lecture Experiment to illustrate Ionisation by Collision and to show Thermoluminescence, by Mr. F. J. Harlow, B.Sc.

Association of Mining Electrical Engineers (West of Scotland Branch).—Saturday, November 15th. At 4.30 p.m. At Royal Technical College, Glasgow. Paper on "Wireless Experiments," by Mr. J. R. Laird.

North-East Coast Institute of Engineers and Shipbuilders (Graduates' Section).—Saturday, November 15th. At 7.15 p.m. Paper on "Centrifugal Pumps," by Mr. A. Temple Thorne, B.Sc.

THE ELECTRICAL ENGINEERS (LONDON DIVISION).

Commanding Officer—Lieut.-Col. H. M. Leaf.

The following orders have been issued for the current week:—

Monday, November 10th.—"A" Company. Technical instruction, 7 p.m. to 10 p.m.

Tuesday, November 11th.—"B" Company. Ditto.

Wednesday, November 12th.—Recruits only. Infantry drill and technical instruction, 7 p.m. to 10 p.m.

Thursday, November 13th.—"C" Company. Technical instruction, 7 p.m. to 10 p.m.

Friday, November 14th.—"D" Company. Ditto.

Saturday, November 15th.—Headquarters will be opened for the transaction of regimental business from 10 a.m. till 12 noon.

(Signed) P. H. Campbell, Captain R.E., Adjutant.
For Officer commanding L.E.E.

NOTES.

Death of Sir William Preece.—It is with profound regret that we learn, as we go to press, that Sir William Preece passed away somewhat suddenly at his home at Carnarvon yesterday (Thursday) morning.

Sir William, as our readers know, had been in very indifferent health for some time past, but it was only last week that he really began seriously to fail.

The deceased gentleman was born in 1834.

Lamp Litigation.—From an announcement appearing in our advertisement pages to-day, it will be observed that the Osram Lamp Works, Ltd., have issued a writ against Pope's Electric Lamp Co., Ltd., of Willesden, for infringement of two specified metal-filament lamp patents. In another announcement Pope's Electric Lamp Co. advise the trade and public that their indemnity for infringement of patent continues to hold good, and they are defending any action.

Electric Clocks at Montreal.—A system of self-winding electric clocks, 69 in number, is to be installed at the new City Hall, Montreal.—*Commercial Intelligence.*

Electric Time Service.—The London Hospital was provided with no fewer than 192 eight-day clocks of every variety of size and quality, and consequently enjoyed 192 different standards of time; hence the proposal to equip the Institution with the "Synchronome" system of electrical time service was welcomed. Some 200 dials have been installed, in connection with a controlling pendulum automatically synchronised every hour from Greenwich.

The inauguration of this electrical time service was marked by a little ceremony on Monday last, when the Hon. Sydney Holland and the other Governors of the hospital gathered round the controlling pendulum in the telephone exchange room at the entrance hall to see the first time signal arrive at 4 p.m., and to hear Mr. F. Hope-Jones, the inventor of the system, briefly describe the installation and explain its operation. On the completion of the work the clocks throughout the Institution had been set to 4 o'clock, and the pendulum was held to one side by means of an electro-magnet controlled from Greenwich Observatory. Precisely at 4 o'clock the pendulum was released and sent out its first impulse to the 200 dials, advancing them half a minute.

Every safeguard against accident that foresight can suggest has been supplied, and even the possibility of severance of the line wire during building alterations has been provided against. This protection is secured by means of a device designed by Mr. H. Dudley Tuffrey, the contractors' manager, which upon a disconnection or other irregularity in the line immediately cuts the faulty section out of the circuit.

The method of synchronisation is worthy of mention. According to whether the minute hand is before the 60th minute, or on or after it, so the Greenwich signal is directed through one of two electro-magnets whose functions are to put a small weight on a tray on the pendulum rod if the clock is slow, or take it off if fast. Consequently the clocks are kept within a fraction of a second of the mean time regulator at Greenwich Observatory.

The work has been carried out by the Synchronome Co., Ltd., under the supervision of Mr. Oatley, the surveyor of the Hospital, who has introduced into this installation a special type of dial for the wards, inserted in the walls and waterproof.

Fatalities.—On October 29th, George Barton (59), a contractor's labourer at Hyde, was employed on some repairs at the Cheshire Cheese Hotel, and was carrying a bucket of cement down to the cellar. At the head of the cellar steps was a door which was open, and the catch penetrated the casing of a live electric wire. By some means the current passed through Barton's body, killing him instantly. Another workman who was in the cellar ran to Barton's assistance, and he also received a shock, but fortunately in his case the result was not serious.

An inquest was held at Manchester on Monday regarding the death of George Draffan (26), electrical engineer, of Barton. Draffan, who was employed by the Lancashire Wire Co., of Trafford Park, was sent on October 4th to examine an electrical travelling crane, which had been reported as out of order. He was examining the installation which controlled the lifting and lowering apparatus when he overbalanced, and fell to the concrete floor, a distance of 19 ft. The current, it was stated, had been shut off before the accident, and to a person who visited him in hospital Draffan said he did not receive any electric shock, but overbalanced. A verdict of accidental death was returned.

According to a London newspaper, one man was killed and another injured by an explosion at the British Thomson-Houston works, Rugby, on Monday. Jack Kendal, a fitter, and George Gamble were working in a room where hydrogen gas is purified when an explosion occurred. Kendal was killed immediately, and Gamble was badly shaken and dazed.

On Saturday evening last, at the Empire Theatre, Cradley Heath, the death occurred of Frederick Clarke, who was employed there as stage carpenter and electrician. An employé discovered him lying in the stokehold at the back of the theatre. In his hand was an electric lamp. Attempts were made to restore animation by means of artificial respiration, but without success. His arms and chest were badly burnt. An inquest was held on Monday, and it was stated that deceased had had seven years' experience. John Cartwright, a checker, said he missed Clarke at seven o'clock on Saturday evening, and found him in the stokehold, lying on his face with an electric lamp, which he had fixed up that afternoon, in his hand. Witness had to switch off the current at the main before the lamp could be removed. The hot-water pipes were against the door of the stokehold, and deceased would have to touch them. The pressure was 200 volts. Dr. T. M. Tibbetts, who had made a post-mortem examination, said there were signs of hæmorrhage at the heart, and the lungs and kidneys were congested. The muscles of the left arm were contracted. The burns were not sufficient to cause death, and there was no evidence of disease to prove fatal. Death, in his opinion, was due to an electric shock. A verdict of "Accidental Death" was returned.

Radium Purchase.—The Radio-Active Oxygen Institute, of London, has purchased two grammes of radium from M. Paul Samter, of Paris, for curative purposes. The Institute has been undertaking the treatment of patients with radium emanation for the past 18 months. The value of the purchase just made is over £60,000.

The Diesel Engine Users' Association.—A new Association has been formed, under the name of "The Diesel Engine Users' Association." The next meeting will be held on Wednesday, November 12th. Any engineer interested in the running of Diesel engines may obtain full particulars as to membership, &c., from the honorary secretary, Mr. A. C. Gilling, Electricity Works, Epsom, Surrey.

Association of Electrical (Station) Engineers.—A meeting organised by the Bradford Section (Mr. H. C. Hughes in the chair) was held at the Old George Hotel, Leeds, October 29th, at which gentlemen representing stations at Leeds, Batley, Keighley, Dewsbury, York and Bradford were present. This being the first meeting of the Association held at Leeds, Mr. R. D. Spurr, of the Bradford Section, explained at length the objects and policy of the A.E.S.E., and a number of questions were asked and answered. It is expected as a result of this meeting that the number of members in this district will be largely augmented. Other meetings will be arranged shortly at Bradford and Huddersfield.

A meeting of the Manchester Section was held at the Manchester School of Technology (Mr. Townley in the chair), on October 30th. Mr. T. S. Wallis read a paper on the subject of "Scientific Measuring Instruments," which was very well received, and evoked an interesting discussion.

On Monday last the Birmingham and Midlands Section held a general business meeting at the Y.M.C.A., Birmingham. Mr. E. A. Gordon, the hon. secretary for this district, having resigned, Mr. J. A. Cook was elected in his place. A similar meeting was also held at Grimsby on October 30th.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The programme for the ordinary meetings of the Institution (London) is as follows:—

November 13th. The President. Address on "Pressure Rises" (experimentally illustrated).
November 27th. S. Evershed. "The Characteristics of Insulation Resistance."
December 4th. Dr. G. Klingenberg. Address on "Electricity Supply in Large Cities."
December 18th. H. C. Gunton. "The Employment of Power in H.M. Post Office."
January 8th, 1914. H. R. Speyer. "The Development of Electric Power for Industrial Purposes in India."
January 22nd. Sir Oliver Lodge, D.Sc., F.R.S. The fifth Kelvin Lecture.

Papers on the following subjects are in preparation for the second half of the session:—

"Some Railway Conditions Governing Electrification."
"Electrification of Railways as Affected by Traffic Considerations."
"Difficulties of the Electrification of Existing Termini and Goods Yards and the Effect of Existing Rolling Stock on the Main Line Electrification Problem."
"Generation of Electrical Energy for the Purposes of Main Line Traction."
"The Design of Traction Motors for Alternating and Continuous Currents."
"Rolling Stock and its Design and Influence on the Energy Consumption of Trains."
"Electric Locomotives."
"Electric Signalling on Railways."
Also a discussion on "Electric Battery Vehicles."

The twelfth annual dinner of the Glasgow Section is to take place on December 11th, at the Grosvenor, Glasgow. The chairman of the Section (Mr. Robertson) is to deliver his inaugural address on Tuesday next, 11th inst. On December 9th Dr. Klingenberg will give an address on "Electricity Supply in Large Cities." On January 13th Mr. H. C. Gunton will read his paper on "The Employment of Power in H.M. Post Office." The Students' Section began its proceedings on October 7th with an address by its chairman, Mr. A. Page. On December 2nd there is to be a paper by Mr. John Menzies on "Some Electrical Troubles I Have Met in Mines." On February 6th, Mr. D. J. M'Kellar will deal with "Wireless Telegraphy," and on March 3rd, Mr. H. A. Stewart will take as his subject "The Maintenance and Repair of D.C. Plant."

The opening meeting of the session of the Manchester Section was held in the Midland Hotel, Manchester, on Tuesday, 4th inst., when Prof. E. W. Marchant (Liverpool University) delivered his inaugural address. The meeting afterwards took the form of a smoking concert, at which an excellent programme was gone through. There were about 120 members present.

Junior Institution of Engineers.—The programme of this Institution includes papers on "Maintenance (Electrical)," by Mr. T. A. St. Johnston, to be read on November 21st, and "Patent Protection," by Mr. A. Abbey, to be read on November 28th. The presidential address by Sir Boverton Redwood, Bart., &c., will be delivered on December 5th.

A Local Section of the Institution, with Manchester as its centre, was inaugurated at a meeting held at the Victoria Hotel, Manchester, on Friday last. Over 60 engineers were present, representing many branches of the industry, the majority of whom signified their intention of joining the Section. Mr. W. A. Tookey, a vice-chairman of the Institution, presided, and said that some of his friends had suggested that Manchester was already well supplied with engineers' societies; but the Junior Institution of Engineers was unique, in that it embraced all engineers, and he claimed that membership would prove of great benefit to the individual. The proposition to send a requisition to the Council asking to be allowed to form a local section was carried *nem. con.*, and the following were appointed officers: Mr. C. H. Prichard, chairman; Mr. Maurice Hird, vice-chairman; and Mr. F. G. Hatch, hon. secretary, the latter appointment to be confirmed by the Committee.

Association of Mining Electrical Engineers.—At the opening meeting of the session of the Yorkshire Branch, the President (Mr. H. C. Jenkins) said that members should endeavour to broaden their knowledge of electricity, because at all mining disasters the first question asked was whether electricity installed underground was the cause. Electricity was made the scapegoat wherever possible, and it was the duty of the mining electricians to disprove this charge. Mr. John Bentham, electrical engineer at the New Sharlston Collieries, Wakefield, gave a paper on "Testing Transformers for Colliery Work." He attributed a good number of colliery accidents to the ignorance of men in charge of machines. The transformer testing plant cost about £35, and had saved his colliery £150 a year.

The opening meeting of the winter session of the Notts and Derbyshire branch was held at Eastwood on Saturday last. The members were given an opportunity of inspecting the electrical power station at Moor Green, which supplies six collieries in the district. Officers were elected, including as President, Mr. L. G. F. Routledge, Eastwood; secretary, Mr. F. Cusworth, East Kirkby.

Northampton Engineering College Engineering Society.—On Friday last a paper on "Military Engineering—Bridging," was read by Mr. Douglas C. Goodswin.

Institute of Marine Engineers.—Last week the Lord Mayor laid the foundation-stone of the new headquarters of the Institute.

Royal Institution.—The eighty-eighth Christmas Course of Juvenile Lectures, founded at the Royal Institution in 1826 by Michael Faraday, will be delivered this year by Prof. H. H. Turner, F.R.S., his title being "A Voyage in Space." The lectures will be experimentally illustrated.

North-East Coast Institution of Engineers and Shipbuilders.—The Hon. Sir Charles A. Parsons, president, at the annual meeting on October 31st, discussed recent advances in marine engineering. Dr. Föttinger had informed him that the aggregate H.P. of his hydraulic gearing ordered within the last 12 months was about 100,000 B.H.P. Electrical gearing had, however, made small progress. Besides the U.S. collier *Jupiter* and the Canadian vessel *Tynemount*, he understood that in America several fire floats of about 800 H.P. had been equipped with electrical gear for working the propeller, fire pumps and other machinery. The use of mechanical gearing had considerably extended during the year, and the H.P. on order or at work now exceeded 400,000 B.H.P.

Manchester Electrical Dispute Settled.—We gather from the *Manchester Guardian* that in this dispute between the Electrical Trades Union and the Electrical Employers' Association, the men demanded an extra 1d. per hour on the present rate of 9d. The employers offered to submit to arbitration or to give an extra ½d. per hour to come into force on the first day in January. A member of the Executive Committee which represents 27 Manchester employers pointed out that the month's notice would be unreasonably short and would involve loss on existing contracts; the present minimum wage is 39s. 6d. per week, and the extra ½d. offered would bring the rate up to the London standard, which is the highest in the country, and not applicable to Manchester conditions.

A joint meeting of the employers and operative electricians on November 4th agreed to an advance of ½d. per hour, providing work is resumed immediately; rules are to be drawn up providing for six months' notice of any change.

Lighting Control Examinations.—The enterprising competition set on foot by Messrs. A. P. Lundberg & Sons has enlisted the interest of many competitors, and the results of the September examinations are announced in our advertisement pages to-day; it will be seen that the candidates hail from all parts of the country, and even from the Continent. We understand that the working of the papers, especially those of the advanced grade, has not been an easy matter for the candidates, and there is evidently plenty of scope for further investigation of the subject. The possibilities of control were certainly not fully realised before Messrs. Lundberg took the matter in hand, and their efforts to promote the study of this subject, and thus to increase the convenience and attractiveness of electric lighting by making full use of one of its unique advantages, are worthy of commendation.

Railway Accident.—On Wednesday the news arrived of still another grave railway disaster, this time in France. According to the *Pall Mall Gazette*, "The mail van was smashed to atoms, the gas tanks exploded, and the wrecked compartments caught fire." The report goes on to say that charred bodies were recovered, and it was almost impossible to identify the dead owing to the way in which they had been burned. About 40 lives were lost, and many persons were injured.

Whist Drive.—A whist drive promoted by the South Lancashire Tramways Co. took place at the club rooms, Howe Bridge, on Wednesday night, October 29th, between 50 and 60 persons taking part.

Stealing Lamps.—A youth named Clifford Jones (17), described as a fireman, was bound over by the Swansea magistrates on Tuesday for stealing 39 electric lamps from the Public Library, Market and Swansea Y.M.C.A.

Appointments Vacant.—Arc lamp repairer, for Newport Corporation; assistant electrical engineer, for Fareham U.D.C. (35s.); overhead lineman, for the Kirkcaldy Corporation Tramway Department. Particulars are given in our advertisement pages.

Inquiries.—The makers of automatic switchgear for the operation of an occulting electric incandescent port light, and makers of the "Kanson" tungsten lamp, are asked for.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. P. E. RYCROFT, electrical engineer to the Heston and Isleworth U.D.C., has had his salary increased from £400 to £425 per annum, rising by annual increments of £25 to £500. He was appointed in July, 1906, at a commencing salary of £300, and reached his maximum three years ago. In recommending the increase, the Electricity Committee directed special attention to the fact that during the last three years station extensions, exclusive of mains, &c., had been carried out to the extent of £10 000, and that had a consulting engineer been engaged, fees of about £500 would have been payable; and they could not speak too highly of the manner in which Mr. Rycroft carried out his duties, and of the special attention given by him to the matter of securing new customers.

MR. C. B. CRIPPS has resigned his position with the L.C.C. tramways, to take up a better position with the Aldershot U.D.C.

At the last meeting of the Gloucester City Council the question of having one general manager for the tramways and electricity undertakings was discussed, and a recommendation of the sub-Committees, that MR. CORSON, at present manager of the electricity works, should be appointed engineer and general manager of the light railways undertaking as well as of the electricity undertaking, if satisfactory arrangements could be made, and that such arrangements should include the appointment of some person to undertake the general duties of traffic manager under the supervision and control of the general manager, was carried. A larger Committee was thereupon appointed to further consider the matter and formulate and submit for consideration a scheme for giving effect to the recommendation.

On October 30th, at the Stoke-on-Trent Electricity Works, MR. TURNBULL, who was leaving to take up the position of electrical engineer at Aylesbury, was presented with a Spod Comport by the works staff. Mr. T. Hall, works foreman, who made the presentation, referred to Mr. Turnbull's work as secretary of the Department's Engineering Society.

General.—MR. C. F. VENNDT, who has been connected with the Great Northern Telegraph Co., Ltd., of Denmark, for more than 43 years, and superintendent of the London station since 1876, will retire from active service at the end of this month. Mr. L. T. Obel has been appointed as his successor from November 1st.

The following are the results of the municipal elections in Yorks so far as they concern the electrical trade:—J. LAW, electrician, the Labour nominee in the South Ward, Halifax, was defeated by the retiring Conservative councillor by a majority of 457; and HARMAN VISGAR, electrical engineer, unsuccessfully contested the Central Ward, Leeds, in the Conservative interest, and by his defeat the Liberals gained a seat.

MR. JOHN BELL SIMPSON, of Bradley Hall, Wylam-on-Tyne, has, through the Lord Mayor of Newcastle-upon-Tyne, given £10,000 to various local charities. A little while ago Mr. Simpson gave £10,000 towards the endowment fund of Armstrong College, Newcastle. Mr. Simpson is well known in the electrical world, being chairman of the Newcastle and District Electric Lighting Co., Ltd., and of the Waste Heat and Gas Electrical Generating Stations, Ltd., and a director of the Cambridge Electric Supply Co., Ltd., Scarborough Electric Supply Co., Ltd., Parsons Marine Steam Turbine Co., Ltd., &c.

Newspaper reports state that MR. T. A. EDISON is suffering from a breakdown in health.

COUNCILLOR ALEX. SINCLAIR, chairman of the Swansea Electric Lighting and Tramways Committee, was re-elected on the Swansea Council, on November 1st, for the Ffynone Ward, gaining a record majority of 196 for the Municipal Reformers over Mr. Dyson Jones (Progressive). Councillor Sinclair has been 16 years on the Swansea Borough Council.

MR. W. L. DEES has resigned his position with Woolwich Borough Council to take up an appointment as reserve shift engineer with the Mersey Electric Railway, Birkenhead.

MR. J. W. LAW, for many years representing Messrs. Crompton and Co., Ltd., in the South Wales district, has commenced business on his own account at Chancery Chambers, Rutland Street, Swansea.

NEW COMPANIES REGISTERED.

Fuller Accumulator Co., Ltd. (131,919).—Registered November 1st, by Tarry, Sherlock & King, 17 Serjeants' Inn, E.C. Capital, £65,000 in £1 shares (20 per cent. preference). Objects: To carry on the business of electrical and general engineers, &c., and to adopt agreements (1) with G. Fuller, G. J. A. Fuller and L. Fuller, and (2) with John C. Fuller & Son, Ltd. The signatories (with one share each) are:—G. J. A. Fuller, Badwell Cottage, Draycot Road, Wanstead, electrical engineer; F. J. Gordon, 7, Tennyson Avenue, Wanstead, electrical engineer; E. W. Clarke, Beechcote, Vicarage Lane, East Ham, electrical engineer; W. F. Moorcroft, 11, St. Dunstan's Road, Forest Gate, E., clerk; T. Jones, 46, Newport Road, Leyton, foreman; C. G. Wood, 82, Wanstead Park Avenue, Wanstead Park, E., electrical engineer; W. J. Brooks, 124, Richmond Road, Leytonstone, clerk. Minimum cash subscription, 2,000 shares. The first directors (to number not less than three or more than seven) are G. Fuller, L. Fuller, G. J. A. Fuller, and F. J. Gordon; qualification (except first directors), £500; remuneration (except managing director), £200 each per annum.

Coventry Electric Cable Co., Ltd. (131,846).—This company was registered on October 29th, with a capital of £100 in £1 shares, to carry on the business indicated by the title. The subscribers (with one share each) are:—E. F. Pierson, 17, Hertford Street, Coventry, chartered accountant; G. E. Bailey, 43, Kensington Road, Coventry, clerk. Private company. Table "A" mainly applies. Registered by E. T. Pierson & Sons, Coventry.

Ozonair, Ltd. (131,863).—This company was registered on October 29th, with a capital of £40,000, in £1 shares (20,000 7 per cent. participation preference), to acquire the business, assets and undertaking of Ozonair, Ltd., to acquire any invention relating to the production, treatment, application, supply and generation of electricity and gas, and apparatus therefor, in particular in relation to improvements in apparatus for ozonising, purifying and other treatment of atmospheric air, and to adopt an agreement with the said old company and T. S. Wederell, the liquidator thereof. The subscribers (with one share each) are:—J. E. Way, 23, Waveney Avenue, Peckham Rye, S.E., clerk; J. H. Jones, 212, Totterdown Street, Tooting, S.W., clerk; A. T. C. Warbey, 57A, High Street, Kingsland, N.E., clerk; W. T. Bond, 31A, Yukon Road, Balham Hill, S.W., clerk; F. W. Feetum, 6, Evesham Road, New Southgate, N., clerk; C. S. Hume, 91, Kentnor Road, Lower Tooting, S.W., clerk; L. P. Weber, 66, Mervan Road, Brixton, S.W., clerk. Minimum cash subscription 12,500 shares. The number of directors is not to be less than three or more than seven; the first are H. E. Salt, T. J. Anderson, S. Gillatt, F.C.S., and E. L. Joseph, M.I.E.E., F.C.S.; qualification, £200; remuneration, £100 each per annum (chairman, £150), and a percentage of the profits. Registered office, 96, Victoria Street, S.W.

Electric Lighting and Engineering Co., Ltd. (131,849).—This company was registered on October 29th, with a capital of £3,000 in £1 shares, to take over the business of an electrical engineer and contractor, and dealer in articles, apparatus and things used in connection therewith, carried on by J. O. Rhodes, as "The Electric Lighting and Engineering Co.," 137, Duke Street, Liverpool. The subscribers are:—J. O. Rhodes, 145, Duke Street, Liverpool, engineer; H. Shipland, 9, Cook Street, Liverpool, consulting engineer; P. Marsh, 9, Cook Street, Liverpool, solicitor. Private company. The number of directors is not to be less than two or more than seven; the first are J. O. Rhodes, H. Shipland, and P. Marsh (all permanent); qualification, £50; remuneration, 10 guineas each per annum. Registered by Richardson, Marsh & Co., 19, Cook Street, Liverpool.

Metals Decoration, Ltd. (131,905).—This company was registered on October 31st, with a capital of £3,000 in £1 shares (1,500 preference), to manufacture and supply metallic ware made by stamping, spinning, or by electro-deposition; to acquire chemical or electrochemical and metallurgical processes, or processes in any manner relating to the production of metallic ware and decoration and ornamentation of metallic or other substances, to carry on business as smelters, refiners, casters, rollers, assayers and manufacturers of and dealers in minerals, metals and ores, electricians, engineers, &c., and to adopt an agreement with S. O. Cowper-Coles. The subscribers (with one share each) are:—Major M. J. W. Pike, 144, St. James' Court, S.W.; Col. F. Cochrane, 34, Cathcart Road, S. Kensington, S.W., retired. Private company. The number of directors is not to be less than three or more than six; the first are Major M. J. W. Pike, Col. F. Cochrane and S. O. Cowper-Coles; qualification, 100 shares; remuneration as fixed by the company. Registered office, 1 and 2, Old Page Street, Westminster, S.W.

Imperial United Lamp Co., Ltd. (131,924.)—This company was registered on November 1st, with a capital of £2,000 in £1 shares, to carry on the business of manufacturers of, and dealers in, lamps, fittings and accessories, electricians, engineers, manufacturers of electrical appliances, &c., and to adopt an agreement with J. C. Moth. The subscribers (with one share each) are:—E. C. Lauderdale, 85, London Wall, E.C., solicitor; J. C. Moth, York Mansions, York Street, S.W., secretary. Private company. The number of directors is not to be less than three or more than seven; the subscribers are to appoint the first; qualification, £100; remuneration as fixed by the company. Registered office, Caxton House, Westminster.

Simplex Insulators (Bourke's Patent), Ltd. (131,771).—This company was registered on October 23rd, with a capital of £3,000 in £1 shares, to carry on the business of electrical and mechanical engineers and contractors, manufacturers of, and dealers in, electrical apparatus, &c., and to adopt an agreement with D. C. Glen and A. M. B. Grahame for the acquisition of the patents and rights referred to therein. The subscribers (with one share each) are:—D. C. Glen, 46, Queen Victoria Street, E.C., engineer; J. W. F. Grahame, 20, Bucklersbury, E.C., chartered accountant. Private company. The number of directors is not to be less than two or more than five; the first are D. C. Glen and A. M. B. Grahame (both permanent, subject to holding £100 shares). Registered office, 20, Bucklersbury, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Brown & Parsons (1913), Ltd.—Particulars of £600 debentures, created October 13th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. No trustees.

Manaos Tramways and Light Co., Ltd.—Trust deed dated October 6th, 1913 (supplemental to trust deed dated October 20th, 1909), to secure £100,000 debentures, part of an authorised series of £500,000, charged on concession by the State of Amazonas on the electric services of the State, including tramway and lighting system in the City of Manaos, and the company's undertaking and property, present and future, including uncalled capital. Trustees: Metropolitan Trust Co., Ltd., Gresham House, Old Broad Street, E.C.

F. L. Mitchell & Co., Ltd.—Particulars of £200 debentures, created October 10th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Electromobile Co., Ltd.—A notice of the appointment of F. Halsall, of 104, King Street, Manchester, as receiver or manager, on October 17th, 1913, under powers contained in instrument dated December 9th, 1908, has been filed pursuant to Sec. 94 of the Companies' (Consolidation) Act, 1908.

E. Brook, Ltd.—A memorandum of satisfaction in full on October 17th, 1913, of deb. dated October 18th, 1912, securing £3,000, has been filed.

Varley Magnet Co., Ltd.—Issue on June 24th, 1913, of £600 debentures, part of a series of which particulars have already been filed. (Notified October 18th.) Particulars of £1,000 second debentures created October 1st, 1913, also filed, pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the amount of the present issue being £500. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

James Keith & Blackman Co., Ltd.—Issue on October 28th, 1913, of £50 debentures, part of a series of which particulars have already been filed.

G. Weston & Son, Ltd.—Debenture dated October 17th, 1913, to secure £2,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: S. Perks, Dolanog, Rhyl, Flint.

Dent & Co. and Johnson, Ltd.—Mortgage debenture dated September 19th, 1913, to secure £500, charged on company's undertaking and assets. Holders: E. Dent & Co., Ltd., 61, Strand, W.C.

Power Plant Co., Ltd.—Debenture dated October 22nd, 1913, to secure £5,000, charged on factory and works at Yiewsley, West Drayton, including fixtures and machinery and company's other assets. Holders: E. M. Hall, Bar House, Fleet Street, E.C.; and E. D. Vaisey, 39, Threadneedle Street, E.C. This debenture ranks *pari passu* with £7,000 prior debentures.

Walton & Clough, Ltd.—Mortgage dated October 4th, and as collateral security thereto, a debenture dated October 14th, 1913, to secure £472, charged on £625 due to company and the company's undertaking and property, present and future, including uncalled capital. Holders: Croft, Perkins, Ltd., Empire Works, Thornbury, Bradford.

Marbro, Ltd.—Issue on October 14th, 1913, of £100 debentures, part of a series of which particulars have already been filed.

Charles Haseler & Sons, Ltd.—Debenture dated October 15th, 1913, to secure £350, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Trafford, Lea House, Gravelly Hill, Birmingham.

Cleveland and Durham Electric Power, Ltd.—Trust deed dated October 6th, 1913, to secure £250,000 5 per cent. debentures, charged on freehold lands, and buildings at Middlesbrough and Seaton Carew, shares and debentures, &c., in the Cleveland and Durham County Electric Power Co., Northern Counties Electricity Supply Co., Ltd., and the company's undertaking and property, present and future, including uncalled capital. Trustees: Law Debenture Corporation, Ltd., 41, Threadneedle Street, E.C., and A. F. Pease, 92, Northgate, Darlington.

Shipston Electrical Co., Ltd.—Particulars of £300 debentures, created October 16th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled and unpaid capital. No trustees.

Gent & Co., Ltd.—A memorandum of satisfaction to the extent of £1,000 of first mortgage debentures, dated January 5th, 1904, securing £17,000, of which £10,000 was outstanding on June 26th, 1909, has been registered.

British Empire Lighting and Construction Co., Ltd.—Deed of indemnity dated October 24th, 1913, to secure any moneys for which the mortgagees may become liable under a guarantee for £500 to the company's bankers, charged on company's undertaking and property, present and future. Holders: M. J. Johnson, The Hall, and W. Gilding, Swineshead, near Boston; M. Watchorn, Donington, near Spalding; and F. S. Robins, Wyncote, Boston.

CITY NOTES.

Monte Video Telephone Co., Ltd.

Mr. Charles Lock (chairman), presided on October 29th, at Winchester House, E.C., over the twenty-fifth annual meeting of the above company.

In moving the adoption of the report (see Electrical Review, page 671), the Chairman said the value of their property stood in the books at £191,000, as against £195,000. A sum of £15,000 had been written off for depreciation, whilst they had added £10,900 as capital outlay. Other items of the balance-sheet did not call for much comment. Stores were rather more than last year, as they found it more convenient to meet sudden demands to keep rather a larger stock of instruments and apparatus in store. Investments were £4,000 more, and as he had said at previous meetings they showed a slight increase over cost price. Bills receivable were £1,000 more than last year, and their cash resources were £7,019, as against £6,138 last year. On the other side there was little change from last year. The profit and loss account showed a very considerable increase in subscriptions over last year. The figures were £69,000 odd as against £61,556 over the previous year. Unfortunately working expenses in Monte Video had gone up to almost the same extent, being £41,549 as against £35,484. The profit for the year was £25,833, as against £25,719 last year, or a difference of about £700 in favour of this year. The increase in the working expenses was due to three or four causes. In the first place they were always under the necessity of dealing with a certain number of removals of instruments from one place to another caused partly by moving and partly by building operations. Another cause was the necessity they were under of transferring a good many of their wires from two of their exchanges to a new one. But perhaps the most important cause for the increase was the necessity for repairing the very considerable damage done by the storm which occurred in March last, and which their manager reported was the severest ever experienced in the River Plate since the formation of the company. It blew down a number of their poles and wires, and it took them two months to repair the damage caused. They were continually subject to storms, which not only caused considerable interruption to the subscribers' communications, but also caused difficulty when it came to renewing the wayleaves, for people who had suffered damage did not care about having the weight of the company's wires resting on their buildings. Their local administration had pointed this out to the authorities, and they, recognising the reasonableness of the request, had acceded to them laying two sections, of about a mile in length, underground. They would pursue the policy of laying the wires underground wherever it was practical. That brought him to the question of underground installation which they had so often talked about at these meetings. For years past they had been desirous of installing an underground system with the object of improving the service and giving the public the benefit of the most modern and up-to-date appliances known. It was not their fault that this had not been done. Their service, he believed, was as good as it could be made under the conditions, but they felt if they could go underground that they could give a better service, and they were always prepared to do so. But in this connection the Government had from time to time talked of installing their own system, and recently a Bill had been introduced into the House of Deputies authorising the Government to establish its own telephone system. One of the deputies raised the contention that the company had no concession for its business, and that when the Government had installed its own system, which would take about four years, they could then calmly order the company to remove their poles and apparatus without receiving any compensation whatever. He need hardly say that the board did not share that view. Even were it the fact that they had no concession, they would not admit the justice of the contention that they should receive no compensation, having regard to the fact that for years they had provided the best telephone service which they were allowed to give, and had incurred a large capital expenditure in doing so—an expenditure heavier than that represented in the balance sheet, because in years gone by they had written off considerable sums from capital account. However, they had taken the best legal opinion they could get, both in Monte Video and in London, and that opinion confirmed the view that the board always held, which was that they not only had a good and valid concession, but that it was one which was perpetual in character. Therefore they considered they had a strong claim for compensation. Still he thought it better to look at it from a business point of view, and he believed the Government must recognise that in putting down a new system such as would meet the requirements, it would mean an expenditure of anything between two and three million dollars, and that was not an easy sum to raise in these days. He ventured to think the Government would have to pay considerably for the accommodation—greater, perhaps, than the amount of profit they could hope to realise by working their own system. These were considerations which he thought must commend themselves to the business instincts of the Government in Monte Video, and they placed considerable reliance on the spirit of fair-play which they were justified in expecting from a civilised Government. At the same time it was well to state that the company were willing to fall in with any reasonable suggestion for the benefit of the public in Monte Video, and were at all times ready to come to a fair arrangement which would meet the reasonable aspirations of the Government and fulfil public requirements, and at the same time safeguard the company's interests. During the year they had received a visit from the manager in London, and had discussed all the problems which affected their property in Monte Video. Whilst in London, Mr. Powell reported fully on the physical conditions of their system, and called attention to the necessity of renewing the switchboard at the central exchange, and aided by the expert advice of Sir John Gavey, they were taking steps to do this. They had been somewhat liberal in their appropriation to the depreciation account in the past, and to meet this expense, they were reducing the amount written off the depreciation and carrying £8,500 to the renewal fund.

Mr. J. G. Le Marchant seconded the motion.

Mr. Snell complained of the action of the Government, which he characterised as scandalous. For years the company had been in the position of having the sword of Damocles hanging over their head. He hoped that a full report of the chairman's speech would be published in Monte Video, so that the public there should know the position. If it came to fighting, he was sure the board would have the thorough backing of the shareholders.

The Chairman said a report of the meeting would be sent to Monte Video. The Government Bill would have to go before the Senate, and they would take care that the views of the company were thoroughly represented in that chamber.

The report was carried, as was also a motion for the payment of a final dividend on the ordinary shares, making 6 per cent. for the year.

A hearty vote of thanks to the board and staff, proposed by Mr. Kingsbury, concluded the meeting.

Metalite, Ltd.

An extraordinary general meeting of this company was held at Salisbury House, E.C., on Thursday, October 30th, Mr W. Stewart presiding, for the purpose of confirming the special resolution adopted at an extraordinary general meeting held on October 13th.

The Chairman, in proposing that the resolution should be confirmed, said that as they were aware, at the extraordinary general meeting, held there on October 13th, the resolution as set out in the notice of October 4th last was duly passed by a large majority. That day's meeting was a formal one, to confirm such resolution with a view to carrying out the scheme of reconstruction of which they approved. The directors would be immediately communicating with the larger shareholders, with a view to forming a strong committee to take in hand the negotiations now existing, and to decide as to the *personnel* of the new board. The first mortgagees, the bankers, had granted a further extension of time to November 30th next, in order that the new company might be registered and the scheme completed. They were, however, indebted to one of their largest shareholders who had during that week paid a certain sum of money to the mortgagees in order to bring about this desirable extension. As he dealt *in extenso* with the position at the first meeting, he would formally move that the resolution set out in the notice be confirmed.

Mr. Bentley, in seconding the motion, said that was simply a confirmatory meeting, and, as the chairman had told them, if it had not been for the generosity of one of their largest shareholders, they would have been placed in a very difficult position. They hoped to get the scheme of reconstruction completed by the end of November.

The motion was adopted.

Edison and Swan United Electric Light Co., Ltd.

The directors' report for the year ended June 30th, 1913, says that after providing for interest on both classes of debenture stock, and depreciation upon freehold properties and plant at the same rate as heretofore, but before allowing for special depreciation on these and other assets, there is a loss of £4,752. The net result after providing for the various depreciations shown in the accounts is a credit balance on revenue account of £1,036, which is carried forward. This result is very disappointing, but has arisen principally from the fact that the manufacture and sale of metal lamps during the whole of last winter was to a great extent suspended in consequence of difficulties which had arisen between the owners of the patents relating to drawn wire lamps and this company. The directors are, however, glad to report that all matters in dispute have now been satisfactorily arranged and the company is manufacturing and selling all classes of metal lamps. Since the company commenced the manufacture of this type of lamp some few years ago, the cost at which they can be produced has been very materially reduced, and the board have therefore had made a careful valuation of the whole of the lamp stocks, and have written them down to approximately present manufacturing cost price.

The value at which various other assets appear in the books of the company has been closely examined, and in order to provide for the special depreciation necessitated by the closing of the Benwell factory, and of the company's own printing works in Maiden Lane, the writing off of obsolete plant and stocks, expenditure on foreign branches, and reduction in value of sundry investments and other minor assets, it has been necessary to provide a sum of £48,014. The reserve account amounting to £45,000, together with an amount of £3,014 out of the sum brought forward from last year, has been allocated for this purpose. The whole of the lamp manufacture has now been concentrated at Ponder's End, and the stocks transferred there from the South Benwell works, which have now been closed down, and the board have had the property valued in view of its disposal. The directors are advised that the amount at which the Benwell property now appears in the books should ultimately be realised. The Queen Street premises, of which the company hold a long lease, have been found unsuitable for the business and steps are being taken to let this property. The lease of 123 and 125, Queen Victoria Street, has therefore been acquired; these premises offer great advantages for carrying on the business, there being a showroom on the ground floor which the directors believe will prove to be admirably suited for the purposes of the company's trade. The premises in College Hill used as a showroom and stores will be finally closed as soon as the new premises in Queen Victoria Street are ready for occupation. The whole of the stores department hitherto carried on there, together with the staff, have been transferred to the Ponder's End works. These changes have enabled the board to make very considerable economies without loss of efficiency, and the result of this policy should materially benefit the earnings during the current year. The directors' fees have also been largely reduced. A gentleman well known in the electrical world has been engaged as sales manager, and from the large experience which he will bring to bear upon this department, coupled with a comprehensive scheme of advertising which has been inaugurated, the directors are looking for considerable expansion in this direction. From the various economies which have been made, together with the increased business likely to accrue from the reorganisation of the sales department and advertising, the board are of opinion that the prospects for the current year are distinctly favourable. Mr. Henry Wolfenden, the late chairman of the company, retired from the board in March last, and at the request of an influential body of shareholders, the board elected Mr. Charles Jermyn Ford as director and chairman. Mr. William Murray, owing to pressure of other business, has also retired from the board. Mr. C. E. Hunter and Mr. E. Gimingham, who have been connected with the company for many years, have been elected technical directors, and shareholders will be asked to confirm these appointments. Mr. Ellice-Clark retires from the position of directors and offers himself for re-appointment.

The annual meeting is to be held at Winchester House, E.C., on Tuesday next.

R. & J. Dick, Ltd.—The directors' report for the year to August 31st last shows a net profit of £71,628, plus £4,198 brought forward. The directors propose to write off goodwill account, £10,000; to write off development account, £8,000; to place to preference dividend reserve fund (making it £30,000), £14,932; to pay a dividend of 4 per cent. on the ordinary shares, less income-tax, and to carry forward £11,473.

Bahia Tramway, Light and Power Co.—It is announced that in view of the resolution of the debenture-holders agreeing to sell the company's undertaking to the Municipality of Bahia at a price which would not suffice to repay the principal of the debentures in full, the coupon for the interest due on November 1st next cannot be paid.

Karachi Electric Supply Corporation, Ltd.—The *Sind Gazette* states that the capital invited by Messrs. Forbes Campbell & Co. for the Karachi Electric Supply Corporation, Ltd., has been over-subscribed, though the period for which the subscription list was to remain open has still some days to run.—*Englishman*, October 4th

West India and Panama Telegraph Co., Ltd.—The directors have announced a dividend of 1s. 6d. per share on the ordinary shares for the past half-year.

Prospectuses.—*Ozonair, Ltd.*—The list of applications was opened on October 31st in a public issue of 15,000 7 per cent. participating preference shares, offered at par. The nominal capital of the company is £40,000, divided into 20,000 participating preference shares (non-cumulative) of £1 each, and 20,000 ordinary shares of £1 each. 18,000 of the ordinary are to be issued credited as fully paid, and include full payment to the vendor company of the purchase price of Ozonair, Ltd. 2,000 ordinary and 5,000 participating preference shares are held in reserve. After the ordinary shares have received a dividend at the rate of 7 per cent., both classes rank rateably in any further distribution. The business and specialities of Ozonair, Ltd., are so well known to our readers that they call for little reference now. The new company is formed to take over that company's business, goodwill, patents, &c., as a going concern, from October 1st. It has been registered to provide adequate capital to cope with the increasing business, and the agreement for sale provides for the new company to pay all the old company's liabilities. A report by Mr. W. J. Dibdin, F.I.S., F.C.S., in regard to the Ozonair systems of water purification and ventilation, and one by Mr. W. Duddell on the general merits of the business, including its apparatus and processes, accompany the prospectus. From Mr. Duddell's report it appears that during the seven years of the company's existence practically all the profits, together with the sum of about £5,000, have been employed in developing and extending the business. Mr. Duddell anticipates a considerable demand for ozone for various purposes, and a large sale for the company's apparatus. No part of the purchase price will be paid in cash; 15,150 ordinary shares will be credited as fully paid, these including 1,000 in respect of goodwill. 2,850 ordinary shares will also be credited as fully paid in respect of the contracts with the vendor company for services rendered in conection with the formation of the company. The The directors attach great value to the foreign rights. The present issue, after payment of preliminary expenses, will provide about £11,500 additional working capital. The services of Mr. E. L. Joseph, the managing director, have been secured for 10 years.

The Fuller Accumulator Co., Ltd.—This company is inviting subscriptions from November 7th to November 17th for 10,000 8 per cent. cumulative participating preference shares of £1 each. The company has been formed to acquire the accumulator patents, business, factory, &c., of Messrs. John C. Fuller & Son, Ltd., of Bow, as a going concern. An abridged prospectus will be found in our advertisement pages to-day, from which it will be seen that the vendors will receive as purchase consideration 5,000 of the preference shares of £1 each, and 45,000 ordinary shares of £1 each. Figures are given as to turnover and net profits, and the estimated contract sales for 1914 are put at £50,000, and for 1915 £100,000.

Mexico Tramways Co.—Shareholders will be asked at a meeting called for November 20th, at Toronto, to approve of an increase of the capital stock of the company, from 20 to 30 million dollars. It is stated that the operation of the tramways and of the Light and Power Co.'s system has not been seriously interfered with during recent events, for the gross and net earnings both show satisfactory increases, but political conditions have unsettled the credit of many Mexican undertakings, and it is at present practically impossible to sell any securities of the company at a reasonable figure. For this reason the company is continuing its loans, which it will pay off as early as convenient from the sale of three-year 6 per cent. secured notes recently created. These notes confer the right to convert to ordinary shares at par during the currency of the notes, and it is chiefly to provide for such conversion that the above increase in capital has been proposed.

Yates & Thom, Ltd.—For the year ended August 9th the directors report a net profit, after providing for depreciation of plant and machinery, interest on mortgage debenture stock, and £2,000 to write down investments, of £9,021, plus £6,621 brought forward. It is proposed to pay a half-year's dividend on the preference shares to September 1st, 1913, less tax, to transfer to reserve fund £2,500, and to carry forward £6,928. The fire in June last caused a serious interruption of the business. The works will very shortly be fully restored. Under the circumstances the directors do not see their way to recommend a dividend on the ordinary shares.

Delagoa Bay Development Corporation, Ltd.—The report for the year ended June 30th, 1913, states that the net revenue from all sources in Lourenço Marques during the year was £28,578. The number of tramway passengers carried was 1,007,996, a decrease of 72,745 on the previous year, but owing to the economies due to the joint working of the tramways and electric light stations, the profits from these sources show an increase as compared with the results for the preceding year. The chairman gave fuller information respecting the undertakings in his speech at the meeting held in London on October 31st.

United Electric Tramways Co., of Caracas, Ltd.—Col. Ivor Phillipps (chairman) presided at the seventh ordinary general meeting of the above company, held on October 30th at the company's offices, Dashwood House, E.C. The proceedings were not open to the Press.

West African Telegraph Co., Ltd.—An interim dividend at the rate of 4 per cent. per annum for the half-year ended June is announced.

Craigpark Electric Cable Co., Ltd.—The directors have declared an interim dividend of 6 per cent. per annum on the preference shares for the half-year ended September 30th.

City of Buenos Ayres Tramways, Ltd.—A quarterly dividend of 1s. 3d. per share is announced.

Cleveland and Durham Electric Power, Ltd.—With reference to our report of the meeting of this company in our issue of October 24th, Mr. Andrew Gemmell, of Ovingham-on-Tyne, writes:—

"The incomplete report of my remarks at the annual meeting of the Cleveland Power Co., held on the 20th inst., is somewhat misleading to your readers, giving me the appearance of having made a dogmatic statement without the support of facts. I said:—'Whoever may have benefited by the waste heat scheme, it has not been the shareholders of the Cleveland Co. When the chairman says that the waste heat scheme has reduced costs, results contradict him, as profits are far below the prospectus estimate, which did not include a waste heat scheme. The financial schemes, the waste heat scheme, and the bulk supply scheme in seven years have all failed to produce 1d. dividend to the ordinary shareholders, and none is in sight, while £58,000 preference dividend is still in arrear.'"

Western Telegraph Co., Ltd.—The directors' report for the half-year ended June 30th, 1913, states that the revenue for the period amounted to £450,822, and the working expenses to £184,264. After providing £16,373 for debenture stock interest, and £8 822 for income-tax, there remains a balance of £241,363, plus £33,817 brought forward, making a total of £275,180. A quarterly interim dividend, amounting to £31,189 has been paid, £100,000 transferred to the general reserve fund, £10,000 to the land and buildings depreciation fund, and £45,000 to the provision on account of investment fluctuations. The directors now recommend a final dividend of 3s. per share, making with the interim dividends, a total dividend of 6 per cent. for the year, also the payment of a bonus of 2s. per share, both free of income-tax, which together will amount to £51,982, leaving a balance of £37,008 to be carried forward. The dividend and bonus will be payable on November 13th.

Companies to be Struck off the Register.—The following companies will be struck off the register at the expiration of three months, unless cause is shown to the contrary:—

Electric Power Plants.
La Régionale Electrique de l'Orne.
Oil Fuel.
Titan Electric Co.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be quoted in the Official List:—

Bell Telephone Co. of Canada, Ltd.—Further issue of $6,250,000 5 per cent. bonds, 1925.

Cape Electric Tramways, Ltd.—The directors have declared a dividend of 5 per cent., free of income-tax.

STOCKS AND SHARES.

Tuesday Evening.

AGAIN there is nothing pleasant to write about. In fact, markets seem to get worse week by week, and any little improvement turns out too often to be merely temporary. The two immediate causes of trouble are money and Mexico. The first is becoming stiffer. Capitalists who wish to lend money on good security can get 5 per cent. upon that of Consols, which is enough to tempt a great many people to utilise their cash in this way rather than invest it in the markets or to leave it on deposit with their bankers at 3½ per cent. The prospect of a rise in the Bank Rate has once more become imminent; and all securities which are affected by Lombard Street are feeling the pinch.

Events connected with Mexico march so rapidly day by day that what stands written on Tuesday evening may be badly out-of-date on the following Friday morning. At the moment, the possibility of intervention by the United States into the Mexican imbroglio is viewed as a matter of the gravest importance and anxiety. The fear is, of course, that should the United States send troops to deal with the situation, as suggested by the reported presentation of an ultimatum, the Mexican revolutionaries might start work upon the railways, power stations, oil machinery, and every other sort of damageable property belonging to a foreigner. For this reason, the market in many things Mexican has been demoralised; and some stocks regarded six months ago as sound securities of their class, have not only undergone alarming shrinkage in value, but are, to all intents and purposes, unsaleable even at the current levels.

Home Rails are in a dismal condition. The silly scare of nationalisation has passed, only to be succeeded by another spasm of tremors lest the labour difficulty should break out again in an acute form. There was a meeting last Sunday night of Midland men, who adopted a far from pleasant attitude because of some trouble that arose over a shunter on the system, and this was used as a lever wherewith to depress prices more than ever.

Amongst Electric stocks, Metropolitans especially suffered, falling 4 because of the realisation of relics of a stale bull account in the market. Districts, for a reason somewhat similar, have shed 3½ points. Underground Electrics maintain a tolerably firm front, the only noticeable movements being declines of ¼ in the £10 shares and of 1 in the 6 per cent. Income Bonds. These latter, by the way, are dipping to a price at which they will appear rather attractive to the speculative investor, for the return upon the money is net, and not subject to Income-Tax. While the Tubes and the London General Omnibus Company are doing so well, the interest on these bonds is fairly secure; but, of course, it is only comparatively recently that the full 6 per cent. has been paid, and if the local authorities happen to campaign against the 'bus company, they might make a sensible inroad into its present profits.

English Electricity Supply shares are amongst the firmest in the House, the movements on the week being insignificant. Small falls occurred in Charing Cross Preference, County Ordinary, Westminster Preference and Metropolitan Ordinary. But in these cases the declines were no more than ½, and improvements of this fraction were secured by Metropolitan Preference and Oxford shares. Urbans are a shade easier, so far as the nominal quotation is concerned, though actually there is little change. Some of the Debenture stocks are a point or so higher. The Edison & Swan report had no effect upon prices, but, of course, its unsatisfactory showing has made the market in the issues more limited than ever. The loss of £4,800 goes against a profit of £10,400 last year, and is due to the dispute with owners of patents relating to drawn wire lamps. The dispute is over now, according to the report, and probably a cheerful view of the outlook will be taken at the meeting. Other manufacturing shares are exceedingly quiet. British Aluminium Ordinary, after their quick rise, reacted $\frac{1}{32}$, and there were small falls in India-Rubber Ordinary and Preference shares. Beyond these, there is nothing of importance to notice.

Stocks and shares in the Telegraph and Telephone list are also steady on the whole. Reuters shares eased off to 9¾, upon the unfortunate circulars recently issued by the company, which have aroused the wrath of those to whom the honour of journalism is so precious. That the company was ill-advised to issue such circulars is manifest enough, and they have been withdrawn by the board. Marconis went back ¼ by reason of the general weakness of markets. Canadian and American Marconis are dull. West India and Panama Ordinary shares remain depressed, but the 1st Preference are ½ better. The Eastern and the Anglo-American groups maintained most of their prices with a considerable amount of strength.

The falls in the Mexican group range from 2 to 7 points, these following, of course, upon other heavy declines during the past few weeks. Prices of shares and bonds alike have literally slumped. Some are simply nominal. The yields at present prices are worth looking at, if only from curiosity. The moot point is, how far the United States will go in its threatened intervention, the matter requiring the utmost delicacy in its conduct. But it is to be noticed that prices in the railway issues have hardened substantially from the lowest; and even amongst the utility issues there was some recovery. Para Electric Railways are flat, a drop of 5s. taking the price to 5½, this being due to the depression that has befallen all things Brazilian. United Electric Trams of Monte Video are also easier; but, on the other hand, the Anglo-Argentine Debentures are rather better.

The Rubber share market shed part of its strength, thanks principally to the all-round weakness of markets. This, however has not dimmed the high hopes raised as to the probability of the Rubber Growers' Association offering practical, and practicable, suggestions for dealing with the difficulties which surround the industry at the present time; and if markets, as a whole, were to take a turn for the better, no doubt that for rubber shares would move with the rest.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	
		£	£		£	£		Inc.
Bath	Oct. 29	3,482	+ 318	42	41,458	+ 3,200	..	..
Blackpool-Fleetw'd	Nov. 1	2,133	+ 472	17	27,911	+ 4,676	8	..
Bristol	Oct. 31	3[illegible],711	+ 3,096	..	25[illegible],608	+ 48,033	30·5	..
*Brit. Elec. Trac. Co.	,, 24	161,788	+ 12,477	..	..	..	429·8	1·25
Chatham and Dist.	,, 30	3,925	+ 402	43	40,469	+ 2,568	14·98	..
Cork	,, 30	2,006	+ 139	43	21,853	+ 670	9·89	..
Dublin	,, 31	16,918	—5,506	..	241,103	—13,429	54·25	..
Hastings	,, 30	3,798	+ 246	..	..	+ 3,454	19·3	..
Lancashire United	,, 29	6,561	+ 1,100	43	67,322	+ 8,054	42	3
Llandudno-Col. Bay	,, 24	946	+ 65	47	16,871	+ 1,433	6·5	..
London United ..	,, 24	25,570	+ 2,109	..	272,666	+ 4,570	..	..
Tyneside	,, 22	2,226	+ 146	17	9,157	+ 625	11	..
Anglo-Argentine ..	,, 28	391,311	+ 1,828	..	4,377,031	+ 181,855	..	..
Auckland	Sept. 26	19,943	+ 1,445	..	..	..	25·42	1·31
Brisbane	Sept.	25,690	+ 2,890	..	282,768	+ 51,674	..	..
Calcutta	Nov. 1	16,978	— 861	..	..	+ 8,854	..	..
Kalgoorlie, W.A. ..	Sept.	3,068	..	..	26,447	..	20·5	..
Madras	Oct. 31	3,503	+ 205	..	35,782	+ 2,541	15·25	1
Montevideo ..	Sept.	27,870	+ 119	..	344,301	+ 26,483	..	..
Cen. London Rly.	Nov. 1	20,585	—1,876	44	212,340	+ 6,783	6·78	·4
City & S. Lon. Rly.	,, 1	11,285	—1,081	44	122,840	—11,637	7·26	..
Dublin-Lucan Rly.	Oct. 31	459	— 72	17½	2,789	— 24	7	..
L'pool Overh'd Rly.	,, 26	6,705	+ 424	..	73,783	+ 5,614	6·6	..
London Elec. Ry. Co.	Nov. 1	55,135	—1,720	44	595,385	+ 810	21·25	..
Mersey Railway ..	,, 1	2,151	— 182	44	28,466	+ 4,888	4·5	..
Metropolitan Rly.	Oct. 26	71,852	+ 4,408	43	757,279	+ 22,224	29·25	3·5
Met. District Rly.	Nov. 1	52,888	— 905	44	568,537	+ 17,602	25	..

*Includes railways and tramways.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations Nov. 4th.	Rise + or Fall —	Present Yield p.c.
	*	1912.	1918.			£ s. d.
Bournemouth & Poole, Ord. ..	10	6	5†	9½ — 10½	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8½ — 9½	..	4 14 9
Do. Second 6 % Pref.	10	6	6	10 — 10½	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 10
Brompton & Kensington, Ord. ..	5	10	9†	8½ — 9	..	5 11 1
Do. 7 % Cum. Pref.	5	7	7	8½ — 8¾	..	4 1 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	5	5	5†	4½ — 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	3½ — 4¾	— ⅛	5 2 10
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3¾ — 3⅞	..	5 16 2
Do. Do. 4 % Deb.	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	10	9	6†	15½ — 16½	..	5 7 6
Do. 6 % Cum. Pref.	10	6	6	12⅛ — 13⅛	..	4 8 11
Do. 5 % Deb.	Stock	5	5	116 —120	+1	4 3 4
Do. 4½ % Second Deb. ..	100	4½	4½	99 — 101	..	4 9 1
County of London, Ord.	10	6	5†	11½ — 12	— ⅛	5 0 0
Do. 6 % Pref.	10	6	6	11½ — 12	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	102½—104½	..	4 6 2
Do. 4½ % Second Deb. ..	Stock	4½	4½	96 — 99 xd	..	4 11 0
Edmundson's, Ord.	£3	..	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	6	6	4 — 4½	..	3 8 7
Do. 6 % Non-Cum. Pref. ..	5	..	..	1½ — 1⅞	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	80 — 83	..	5 8 5
Folkestone	5	6	6	4½ — 4⅞	..	6 3 1
Do. 5 % Cum. Pref.	5	5	5	4½ — 4⅝	..	5 2 7
Do. 4½ % First Deb.	100	4½	4½	89 — 91	..	4 19 0
Hove	5	9	8†	7⅞ — 8¼ xd	..	5 10 9
Kensington & Knightsbridge, Ord.	5	8	8†	7⅞ — 8	..	5 0 0
Do. 4 % Deb.	Stock	4	4	88 — 91	..	4 7 11
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	74 — 78	..	5 15 5
London Electric, Ord.	3	2½	..	1¼ — 1⅝	..	4 12 7
Do. 6 % Pref.	5	6	6	4½ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb. ..	Stock	4	4	90 — 93	..	4 6 0
Metropolitan	5	4	4†	3½ — 3¾	— ⅛	5 6 8
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜	+ ⅛	4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort Deb.	Stock	3½	3½	79 — 82	..	4 5 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	+1	4 18 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 10⅜	..	5 11 7
Oxford	5	7	6†	6 — 6⅛	..	5 7 8
St. James' and Pall Mall, Ord. ..	5	10	10†	8¾ — 9¼	..	5 8 1
Do. 7 % Pref	5	7	7	6¾ — 7	..	5 0 0
Do. 3½ % Deb.	100	3½	3½	89½ — 85½	..	4 1 10
South London, Ord.	4	5½	..	2¾ — 3¼	..	7 0 9
Do. 5 % First Mort. Deb. ..	100	5	5	96 — 99	..	5 1 0
South Metropolitan, 7 % Pref. ..	1	7	7	1 1/16 — 1 1/8	..	6 1 3
Do. 4½ % First Deb. Stock ..	100	4½	4½	93 — 96	..	4 13 9
Urban, Ord.	£3	Nil	..	5/16 — 11/16	—1/16	..
Do. 5 % Cum Pref.	5	3	..	2⅜ — 2¾	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	83 — 86	..	5 4 8
Westminster, Ord.	5	10	10†	8½ — 8¾	..	5 14 3
Do. 4½ % Cum Pref.	5	4½	4½	4⅝ — 5	— ⅛	4 10 0

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6†	4⅞ — 5⅛	..	5 17 1
Calcutta, Ord.	5	8½	..	7¼ — 7⅝	..	5 9 8
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Calgary Power, 1st Mort. Bds. ..	100	5	5	91 — 93	..	5 7 6
Canadian Gen. El. Com.	$100	7	7†	105 —110	..	6 7 3
Do. 7 % Pref.	$100	7	7	117 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	5	..	⅝ — 11/16	..	6 8 1
Do. 5 % Deb.	100	5	5	91 — 93	..	5 7 6
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	91½ — 93½	..	6 8 4
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	92 — 94	..	5 6 5
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/32 — 3/32	..	Nil
Do. 6 % Pref.	1	6	6†	3/32 — 4/32	..	11 5 8
Kaministiquia Power, 5 % G. Bs.	$500	5	5	101½ —104½	..	4 15 8
Madras, Ord.	5	Nil	..	1¼ — 1⅜	..	..
Melbourne, 5 % 1st Mort. Deb. ..	100	5	5	103 —106	..	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	65 — 70	—5	7 2 10
Mexican Lt. & Power, Common	$100	4	4	50 — 55	—5	7 5 6
Do. 7 % Cum. Pref.	$100	7	7	80 — 85	—7	8 4 8
Do. 5 % 1st Mort. Gold Bds.	..	5	5	72 — 77	—6	6 9 10
Do. 5 % 2nd Mort. Bonds ..	100	5	5	65 — 70	—4½	7 2 10
Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	100	5	5	70 — 72	— 6½	6 19 0
Montreal, Lt., H. and Power ..	$100	9	10†	213½ —217½	..	4 12 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	15 — 25 xd	..	..
River Plate, Ord.	Stock	10	..	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	99 —104 xd	..	5 15 5
Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 4
Shawinigan Water, Capital ..	$100	5½	6†	133 —138	..	4 0 11
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	105 —107	..	4 18 6
Do. 4½ % Per. Deb.	Stock	4½	4½	100⅛—102½	..	4 7 10
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref. ..	1	6	6	13/16 — 15/16	..	6 8 0
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	108 —105	..	5 14 8

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4½	..	6⅞ — 7⅜	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	95 — 97	..	5 3 1
American Telep. & Teleg., Cap.	$10	8	8	124 —126	..	6 7 0
Do. Collat. Trust	$100	4	4	91 — 93	..	4 6 0
Anglo-American Telegraph ..	Stock	3	3	62 — 65	..	4 12 4
Do. 6 % Pref.	Do.	6	6	104½—105½	+ ½	5 13 9
Do Def.	Do.	30/-	..	23½ — 23¾	..	6 6 4
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	8	..	7 3/16 — 7 5/16	..	5 5 7
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	79 — 81	..	4 18 9
Cuba Telegraph	10	6	6†	8½ — 9¼	..	6 9 9
Do. 10 % Pref.	10	10	10	14½ — 15½	..	6 11 2
Direct Spanish Telegraph, Ord.	5	4	4	8¼ — 8¾	..	5 6 8
Do. 10 % Cum. Pref	5	10	..	6¾ — 7¼	..	6 12 0
Direct United States Cable ..	10	4	4†	6⅝ — 7⅛ xd	+ ⅛	5 12 3
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	126 —129	—1	5 8 6
Do. 3½ % Pref. Stock	Do.	3½	3½	75— 77	..	4 10 11
Do. 4 % Mort. Deb.	Do.	4	4	96 — 97 xd	..	4 2 6
Eastern Extension	10	7	7	12¼ — 12⅝	..	5 9 10
Do. 4 % Deb.	Stock	4	4	94 — 96	..	4 3 4
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	.. ..	..	..
Globe Telegraph and Trust ..	10	6	6†	10½ — 11½	..	5 6 8
Do. 6 % Pref.	10	6	6	11⅛ — 12⅛	+ ⅛	4 17 0
Great Northern Telegraph ..	10	20	5†	30½ — 32½	— ½	6 2 8
Indo European Telegraph ..	25	13	5†	56½ — 58½ xd	..	5 11 1
Mackay Companies Common ..	$100	5	5	82 — 86	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 70	..	5 14 4
Marconi's Wireless Telegraph ..	1	20	..	3½ — 3⅝	— ⅛	5 10 2
Do. 7 % Cum. Partic. Pref. ..	1	17	..	2⅞ — 3	— ⅛	5 13 4
Monte Video Telephone, Ord. ..	1	6	6	¾ — 1 xd	— 1/32	6 0 0
Do. 5 % Pref.	1	5	5	1 1/32 — 1 3/32 xd	— 3/32	6 8 1
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	96⅜ — 97⅜ xd	..	4 12 1
Oriental Telep. and Elec. ..	1	10	10†	1 7/16 — 2 xd	+ 1/32	5 0 0
Do. 6 % Cum. Pref.	1	6	6	1 5/16 — 1 3/8 xd	— 1/32	5 1 1
Do. 4 % Red. Deb.	Stock	4	4	86 — 88	..	4 10 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96½ — 98½	..	4 1 3
Reuter's	10	10	10†	9½ — 10	..	10 0 0
Submarine Cables Trust	Cert.	6	6	121 —124 xd	..	4 16 0
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	..	4 12 11
United River Plate Telephone Do. 5 % Cum. Pref.	5	8	6†	6½ — 6¾ xd	..	5 1 6
West Coast of America	5	5	5	5 — 5½	..	4 11 0
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	2½	2½	..	1 1/16 — 1 1/16	..	4 3 4
West India and Panama Teleg.	100	4	4	94 — 97	..	4 2 6
Do. 6 % Cum. 1st Pref. ..	10	1½	..	2⅜ — 2¾	..	4 15 3
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9½ — 10½	+ ⅛	5 17 1
Do. 5 % Debs.	10	6	6	9¼ — 10¼	..	6 3 1
Western Telegraph, Ltd. ..	100	5	5	98 —100	..	5 0 0
Do. 4 % Debs.	10	7†	7	13⅞ — 15⅜	..	5 4 8
Western Union 4½ % Fdg. Bonds	Stock	4	4	94 — 96	..	4 3 4
	$10.0	4½	4½	92 — 95	..	4 14 9

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 3s. in Funded Dividend Certs.

Continued on next Page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Nov. 4th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	3/8 — 5/8	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	12⅞ — 14	— ½	..
Do. Do. Deferred	100	..	..	4 — 6	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	86 — 89	..	6 14 10
Do. 7 % Non-Cum. Pr'f.	100	8	..	48 — 51	..	5 17 8
Do. 5 % Perp. Deb.	100	5	5	90 — 93	—1	5 7 6
Do. 4½ % 2nd Deb.	100	4½	4½	75 — 78 xd	..	5 15 5
Central London Railway, Ord.	100	8	8	61 — 66	..	4 11 0
Do. Gtd. Assented	100	..	4	78 — 80	..	5 0 0
Do. Pref.	100	4	4	70 — 75	..	5 6 8
Do. Gtd. Assented	100	..	4	81 — 83	..	4 16 3
Do. Def.	100	2	..	60 — 65	..	3 1 7
Do. Gtd. Assented	100	..	4	77 — 79	—1	5 1 3
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	98 —100	..	5 0 0
Do. Do. 1896	100	5	5	98 —100	..	5 0 0
Do. Do. 1901	100	5	5	96 — 98	—1	5 2 0
Do. Do. 1908	100	5	5	96 — 98	..	5 1 9
Do. 4 % Deb.	100	4	4	91 — 93 xd	..	4 6 0
Hastings Trams, 6 % Pref.	1	6	6†	⅜ — ½	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	66 — 71	..	6 6 9
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2 1/16 — 2 1/16	..	4 17 7
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	77 — 81	..	6 3 5
London and Suburban, Ord.	1	..	..	1/16 — 3/16	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	3/16 — 5/16	..	..
Do. Do. 4½ % 1st Deb.	100	4½	4½	77 — 82	..	5 9 9

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Nov. 4th.	Rise + or Fall —	Present Yield p.c
	*					£ s d.
London Elec. Railways, 4 % Deb.	100	4	4	90 — 92	—1	4 7 0
London United Trams, 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Metropolitan Railway Consol.	100	1⅝	1½†	39 — 39½	—¼	4 2 8
Do. Surplus Lands	100	2⅜	2⅜	58 — 60	—1	4 11 8
Do. 3½ % Deb.	100	3½	3½	83 — 85	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	78 — 80	..	4 7 6
Do. 3½ % Con. Pref.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan District Ord.	100	Nil	..	28 — 28½	—3½	Nil
Do. 6 % Deb.	100	6	6	136 —139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5
Do. 4 % Prior Lien	100	4	4	93 — 95 xd	..	4 4 3
Do. 4½ % First Pref.	100	4½	4½	82 — 84	..	5 7 2
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	84 — 86	..	5 4 8
Do. 5 % Deb.	100	5	5	86 — 89	..	5 12 0
Potteries, Ord.	1	3½	..	7/16 — 7/16	..	..
Do. 5 % Pref.	1	5	5	11/16 — 13/16	..	7 5 6
Do. 4½ % Deb.	100	4½	4½	82 — 85	..	5 6 5
South Metro. Trams, 6 % Pref.	1	6	6†	⅝ — ¾	..	8 0 0
Do. 4 % Deb.	100	4	4	68 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	3½ — 3¾	— ¼	Nil
Do. "A"	1/-	..	..	1/16 — 3/16	..	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	110 —113	..	5 8 1
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do 6 % Income	100	6	6	88 — 89	—1	6 14 10
Yorkshire (West Riding), Ord.	5	Nil	..	1/16 — 3/16	..	Nil
Do. 6 % Pref.	5	3	1½†	8½ — 4	+ ⅛	..
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 6 0

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5⅛	5⅛	4 7/16 — 4 7/16	..	5 12 10
Do. 2nd Pref.	5	5⅛	5⅛	4 1/16 — 4 1/16	..	6 3 11
Do. 4 % Deb.	100	4	4	91 — 93	..	4 6 0
Do. 4½ % Deb.	100	4½	4½	97 — 99	+ ½	4 11 0
Do 5 % Deb.	100	5	5	99 1/2 —100 1/2	..	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	100 —101	..	4 18 0
Bombay Elec. S & Trams, Pref.	10	6	6	10 3/4 — 11 1/4	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 13 9
Do 5 % 2nd Deb.	100	5	5	96 — 99	..	5 1 0
Brazilian Traction, Light and Power	$100	6	6†	83 1/2 — 85 1/2 xd	—2	7 0 4
Brisbane Trams Invt., Ord.	5	8	8	7 1/4 — 7 3/4 xd	+ ¼	5 3 3
Do. 5 % Pref.	5	5	5	4 7/8 — 5 1/8 xd	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 3
B. Columbia Elec. Rly., Def.	100	8	8†	1 9 —123	—1	6 10 1
Do. Pref. Ord.	100	6	6	106 —110	—2	5 9 1
Do. 5 % Pref	100	5	5	99 —102	..	4 18 0
Do. 4½ % 1st Mort. Deb.	40	4¼	4½	97 —100	..	4 10 0
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	90 — 93	+1	4 11 5
Calcutta Trams, Ord.	5	7½	5†	6 — 6½	..	5 15 5
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	96 — 99	..	4 11 0
Cape Electric Trams	1	5	..	1/16 — 1/8	..	6 8 1
City Buenos Aires Trams (1904)	5	5†	5	5½ — 5⅝	..	4 13 0
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	88 — 92 xd	..	5 8 8
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ — 98½	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	0 — 3/16	—3/16	Nil
Do. 5% A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 6% B Deb.	100	3	..	10 — 20	..	..

La Plata Elec. Trams, Ord.	1	..	..	3/16 — 1/4	..	..
Do. Pref.	1	4½d.	6	3/4 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 — 1¼	..	4 16 1
Do. 6 % Pref.	1	6	6	1 3/16 — 1 5/16	..	5 1 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr., 6% Cum. Pref.	5	6	6	4½ — 5½	..	5 17 1
" Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87 — 89	..	5 12 4
Manila Elec. R. and Ltg., Bonds	$1000	5	5	96½ — 98½	..	5 1 6
México Trams Con	$100	7	7	73 — 77 xd	—1½	9 1 10
Do. Gen. Con. 5 % Bonds	..	5	5	72 — 77	—5⅛	6 9 10
Do. 6 % Bonds	100	6	6	78 — 83	—6	7 6 4
Para Elec. Rlys. & Lt., Ord.	5	10	10†	5½ — 5¾	— ⅛	8 14 10
Do. 6 % Pref.	5	6	6	4¾ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	..	5 1 0
Perth (W.A.) Elec. Tr., Ord.	1	5⅛	..	1⅛ — 1⅜	..	4 0 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	94 — 96	..	4 18 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	98½ —100½	..	4 19 6
Do. 5 % Mort. Bonds	100	5	5	83½ — 90½	..	5 10 6
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$500	5	5	98 —101	—2	4 19 0
Singapore Trams, 5 % Deb.	100	5	5	86 — 90	..	5 11 1
Southern El. Tr. B.A., 5 % Deb.	100	5	5	93 — 95	..	5 5 3
Un. Elec. Trams Monte Video	5	7	7	4⅞ — 5⅛	— ⅛	6 13 4
Do. 6 % Pref.	5	6	6	5 — 5½	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	93½ — 96½ xd	..	5 3 8
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	98½ —100½	..	4 9 7

MANUFACTURING COMPANIES.

Aron, Ord.	1	7	..	9/16 — 13/16	..	8 12 4
Do. 6 % Pref.	1	6	6	15/16 — 1 1/16	..	7 13 4
Babcock & Wilcox	1	16	..	2 3/8 — 3	..	5 6 8
Do. Pref.	1	6	6	1 7/16 — 1 7/16	..	4 3 6
British Aluminium, Ord.	1	..	..	1 15/16 — 1 31/32	— 1/32	..
Do. 6 % Cum. Pref.	1	6	6	1 1/16 — 1 3/16	..	6 8 0
Do. 5 % Prior Liens Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	85½ — 87½	..	6 14 3
B.I. & Helsby Cables	5	10	..	8 — 8½	..	5 17 8
Do. Pref.	5	6	6	6 — 6½	..	4 12 4
Do. Deb.	100	4½	4½	100 —103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	92 — 95	..	4 14 9
British Westinghouse, Pref.	8	Nil	..	1/16 — 1/8	..	Nil
Do. Deb.	100	4	4	66 — 69	..	5 15 11
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	8/- —8/6	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70½ — 75½	..	6 12 5
Do. 4½ % Deb.	100	4½	4½	35½ — 40½	..	11 2 2
Do. 4½ % Second Deb.	100	4½	4½	23 — 27	..	16 13 4
Callender's Cable	5	15	5†	10¾ — 11½ xd	..	6 10 5
Do. Pref.	5	5	5	5 — 5⅛	..	4 15 3
Do. Deb.	100	4½	4½	96 — 99	..	4 10 6
Castner-Kellner	1	20	..	3 1/16 — 3 3/16	..	5 1 7
Do. Deb.	100	4½	4½	103 —105	..	4 5 9

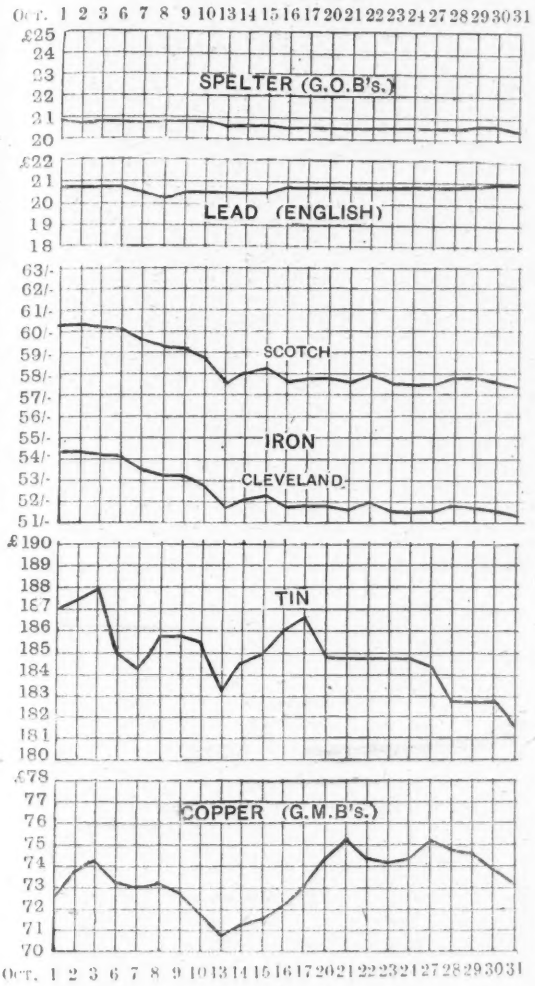
Crompton & Co., Deb.	100	5	5	61 — 66	+1	7 11 6
Dick, Kerr	1	Nil	..	3/16 — 5/16	..	..
Do. Pref.	1	6	6	2 3/16 — 2 5/16 xd	..	7 2 2
Edison & Swan, A, £8 paid	5	Nil	..	0 — 1/8	..	Nil
Do. fully paid	5	Nil	..	1/16 — 1/8	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	63 — 68	..	7 7 1
Electric Construction	1	5	..	1/16 — 1/8	..	7 5 6
Do. Pref.	1	7	7	1/16 — 1/8	..	6 11 9
Greenwood & Batley, Pref.	10	7	7	7 3/16 — 7 5/16	..	9 13 2
Do. Deb.	100	5	..	92 — 94	..	5 4 2
General Electric, 6 % Pref.	10	6	6	9½ — 10¼	..	5 14 3
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	10†	12½ — 13	..	5 15 5
Do. Pref.	5	4½	4½	4 3/16 — 5 1/16	..	4 8 11
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	7½	5	13½ — 14	..	5 7 2
Do. Pref.	10	5	5	9½ — 10	— ⅛	5 0 0
Telegraph Construction	12	20	5†	37 — 39	..	6 8 1
Do. Deb.	100	4	4	96 — 98	..	4 1 8
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	4	55 — 60	..	6 13 4

* Unless otherwise stated all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 2nd, 1913.

METAL MARKET.

Fluctuations in October.



E.T.B.I. Dramatic Performance.—Last year the Electrical Trades Benevolent Institution funds benefited to the tune of £50 by the performance arranged by the Garrick Dramatic Society, and we are sure that all subscribers and well-wishers of the Fund will be pleased to hear that a second performance is to be given by the same Society on Saturday, November 22nd, at the Royal Court Theatre, Sloane Square, S.W., at 8 o'clock p.m. This time they will give "The Voysey Inheritance," by special permission of the author, Mr. Granville Barker. Last year the Benevolent Institution should only have benefited by the tickets which its own members disposed of, but the amount handed over was very much in excess of what was due under the arrangement, the percentage on the number of tickets thus disposed of being very much below the £50. In view of this circumstance, it is to be hoped that the members of the electrical industry will give the present movement still better support than last year. The event will afford the opportunity of simultaneously enjoying an excellent performance and aiding the funds of an equally excellent institution. The prices for admission are :—Orchestra stalls, 10s. 6d. ; dress circle, 7s. 6d. ; upper circle, 4s. ; pit stalls, 4s. and 3s. ; gallery (by ticket), 1s. Private boxes may be secured by arrangement. Tickets may be obtained from Mr. F. B. O. Hawes, the secretary, 18, Park Mansions, Vauxhall Park, S.W. ; or from Mr. L. G. Tate, 20, Bucklersbury, E.C.

Trenching through Stone.—To accommodate electric power cables which will cross the River Seine on the 300-year-old Pont Neuf, Paris, a trench 4 ft. wide and 7·5 ft. deep is being cut through the solid masonry and flint-rock concrete of the bridge structure with the aid of helicoidal wires and abrasive powder. The section trenched in this way, 550 ft. in length, was found to be too hard to be attacked by tools, while explosives were excluded for fear of weakening the venerable arches. Four parallel wire cuts were made in each of the three sections, each roughly 200 ft. in length. An 18-H.P. motor operated the continuous-belt cutting wires, which were held taut by weights, while abrasive powder was fed into the kerfs.—*Electrical World.*

WIRELESS TIME SIGNALS AND TAXATION.

We have received the following letters from Mr. F. Hope-Jones, who, on behalf of the watch and clockmaking profession, has led the opposition to the proposal of the Postmaster-General to tax the users of the wireless time signals. As the British Government cannot even claim that it has incurred any expense by issuing these signals, which have been left to foreign initiative and organisation, the injustice of levying a tax upon those who merely wish to receive the signals for professional purposes is patent.

[COPY.]

General Post Office, London.
October 20th, 1913.

Sir,—With reference to your letter of July 17th last, and subsequent interviews on the subject of licences for the reception of the time signals by wireless telegraphy, I am directed by the Postmaster-General to inform you that, although the conditions upon which such licences can be issued have not yet been definitely decided, it is probable that an annual royalty may be charged, in addition to the fee of £1 1s. already asked for in respect of the expenses involved in the issue of the licence. Licences cannot be issued until a decision is arrived at, but meanwhile applicants are being authorised to proceed with the installation of their apparatus, provided that they will make a deposit of £3 3s. (or £2 2s. if the fee of £1 1s. has already been paid), and will undertake to conform to the conditions of the licence when it is issued, or to dismantle their apparatus without delay should they find themselves unable to accept the conditions. The deposit will be refunded should they decide not to proceed with their applications.

I am, Sir, your obedient servant,
(Signed) E. W. Farnall.

F. Hope-Jones, Esq., M.I.E.E.,
Synchronome House,
32-34, Clerkenwell Road, E.C.

[COPY.]

Synchronome House,
32 and 34, Clerkenwell Road, E.C.
October 22nd, 1913.

Wireless Telegraphy.

The Secretary,
General Post Office, E.C.

Dear Sir,—I beg to thank you for your letter of the 20th inst., but I greatly regret to hear that the idea of charging an annual royalty for the reception of time signals is even contemplated.

The question being still undecided, it is my duty to put before you as concisely as possible the grounds upon which the watch and clockmaking profession in this country claim permission, if not the right, to listen to the International Service of Time Signals.

They are necessary to the advancement of the science of accurate time measurement.

They do not in any way conflict with your department's service of telegraphic time signals, which latter are intended for another purpose altogether, viz., the physical synchronisation of clocks, and which have no pretensions to the same high degree of accuracy.

The clockmakers of other countries, *e.g.*, France, are freely permitted to listen to them, and refusal here would unfairly handicap the profession in the markets of the world, and would tend to a restriction of trade.

The international code of signals is designed for the accurate comparison of chronometers and clocks, and, as such, is intended for the use of the watch and clockmaking profession, consequently they would consider it a great hardship to be debarred from benefiting from it. Their powerful Trade Associations will concentrate upon a strong protest, and they will never rest until they secure freedom to listen to the pulse beats which are their very life, well knowing the harmlessness of so doing.

On the grounds of mere expediency, I suggest it would be well to realise—

1. That the Wireless Telegraphy Act of 1904 did not contemplate any such service, and in view of its many well-known deficiencies, your interpretation of it is likely to be called in question, if acute resentment is aroused by such a proposed interference with the liberty of the subject in the exercise of his profession in an obviously harmful manner, and

2. That refusal would almost certainly result in evasion of the law by the unauthorised setting-up of simple receiving apparatus capable of taking the Paris and Norddeich signals.

If the signals were transmitted from the Greenwich Observatory a small charge to meet the expenses might be levied with some appearance of justification, but unfortunately the British Empire elected to take no part in the organisation or transmission of the World's Time Signals, hence the proposal to tax those who desire to listen to them will appear to the watch and clockmaking profession of this country as preposterous and as futile as a tax on taking their time from the stars. I suggest there is no more reason for your denying them the use of their ears, than the use of their eyes.

In the hope that these views will commend themselves to you and that you will pardon the freedom with which they are expressed,

I beg to remain, yours faithfully,
(Signed) F. Hope-Jones, M.I.E.E., M.Brit.Hor.Inst., &c.

TUNGSTEN LAMPS OF HIGH EFFICIENCY.

(*Continued from page* 698.)

In the second paper the authors state that by making use of the foregoing principles they have been able to construct practical tungsten lamps which, starting at an efficiency of about 0·4 watt per candle, have run over 2,000 hours, the average efficiency during life being better than 0·5 watt per candle. This improvement has been reached only in lamps taking large currents.

The early experiments with lamps containing nitrogen at atmospheric pressure were made with ordinary single-loop filaments of 0·005 and 0·010 in. diameter placed in long heater lamp bulbs. These lamps were set up on life test at such a voltage that the temperature of the filament was 2,850° also.

The results indicated clearly the desirability of using a filament of large diameter. Thus doubling the diameter increased the efficiency from 0·65 to 0·56, and increased the life from 90 to 300 hours. The life of the filament is determined largely by the loss of tungsten from the filament by evaporation, and has been found to be dependent on the relative decrease in diameter caused by this evaporation. The relative lives of very small wires in nitrogen are nearly proportional to the squares of their diameters.

It is, however, not desirable to use filaments of very large diameter if similar results can be obtained with smaller ones. The current taken by a filament increases approximately with the three-halves power of the diameter. Unless very low voltages are used, the power consumed with the larger wires is so great that only very high candle-power lamps can be made. Therefore it was of vital importance to increase the effective diameter of the filament without decreasing its resistance, and various methods of doing this were tried. The method which has thus far proved most satisfactory is to wind the filament into the form of a tightly coiled helix.

The filament is designed so that the amount of sagging during life will be perceptible, but not enough to cause too great a change in the characteristics of the lamp. If, during the life of the lamp, any part of the filament should, for any reason, evaporate more rapidly than the rest, so that the filament becomes somewhat thinner, this portion will have less mechanical strength than the rest and will therefore sag more rapidly. The helix will therefore open out wherever the filament becomes thin or becomes overheated. This will cause increased heat loss both by convection and radiation, and thus prevent local overheating or spotting. The use of helically wound filaments increases the life of the lamp many times beyond the life that would be obtained with a straight filament running at the same efficiency.

In ordinary lamps about 20 per cent. of the energy radiated from the filament is intercepted by the glass and causes heating of the bulb. In the nitrogen lamp, beside this radiated heat, there is an additional amount of heat carried to the bulb by convection—an amount varying with the type of lamp and ranging from 6 to 40 per cent. of the total input. The convection currents carrying this relatively large amount of heat travel vertically upwards from the filament and strike a relatively small area of the bulb, which thus tends to become greatly overheated. Unless special precautions are taken, this overheating will cause the liberation of enough water vapour to cause attack of the filament and consequent blackening of the bulb. It is thus highly desirable, in ordinary cases, if small bulbs are to be used, that the filament should be placed in the lower part of the bulb. This has the further advantage that it allows sufficient surface of glass in the upper part for the deposition of the tungsten nitride.

For a similar reason it is generally desirable, although not necessary, to make the bulbs with their height considerably greater than their horizontal diameter.

By special design of the bulb, satisfactory lamps have been made with bulbs of only one-half to one-third as large a volume as that of evacuated lamps of the same wattage. This means that for bulbs of the same volume, the nitrogen lamps give roughly from five to ten times the candle-power of evacuated lamps. The bulbs of such lamps naturally run much hotter than those of ordinary lamps. The upper parts of the bulbs are often 100 to 200° C. or more, while the lower parts are sometimes much cooler than this although closer to the filament.

Several special varieties of heat-resistant glass have been used for the bulbs, making considerably smaller ones possible, as well as rendering it easier to get rid of water vapour.

For some of the larger size lamps which take heavy currents (20-30 amperes) it has been necessary to devise special types of lead-in wires. Platinum has been discarded entirely, even in the smaller sizes. Several types of heavy-current leads have been successfully used. Most depend on the use of special alloys which have the same coefficient of expansion as the glass. Bulbs of special glasses into which tungsten or molybdenum wire can be sealed directly, have also been used

With very large wires (0·020 to 0·040-in. diameter), which take 20-60 amperes, the efficiency may reach 0·40 watt per candle, and probably even better, and yet give a life over 1,000 hours. A lamp taking 60 amperes and giving 6,600 C.P. at 0·40 watt per candle has been successfully run. It will probably be worth while, in some cases, to use nitrogen in low-current lamps, even if an efficiency no better than that of vacuum lamps is obtained, in order to gain certain other advantages of the nitrogen-filled lamps, such as better colour of the light, higher intrinsic brilliancy, &c.

Unless special expedients are employed, the cooling effect of the leads lowers the efficiency of the lamps. With voltages of 20 volts or more this effect is not serious, but for low voltages it may become very important.

For the particular type of nitrogen-filled lamp which has at present been furthest developed, it may be said that a life of over 1,500 hours is obtained at efficiencies better than 0·50 watt per candle, only in large units taking over 10 amperes. Lamps running at 0·6 to 0·7 watt per candle have been made in units taking at least 5 amperes.

No serious difficulty has been met in making high-voltage lamps. In nitrogen at atmospheric pressure there is no tendency toward arcing, even at 250 volts. Many lamps taking 6 or 7 amperes at 110 volts have been made up and run at 0·6 to 0·7 watt per candle, with a life of over 1,000 hours.

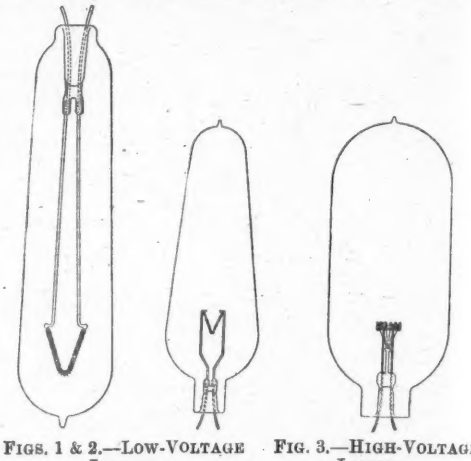
A number of special types of nitrogen-filled lamps have been made and tested. Large units of very high efficiency (0·4 to 0·5 watt per candle with a life of 1,500 hours or more) take currents of 20 to 30 amperes and (except in units over 4,000 C.P.) are best run from A.C. circuits by means of small transformers or auto-transformers giving a voltage depending on the size of unit desired. Thus, with 30 volts and 25 amperes, the power would be 750 watts, and this, in a lamp of, say, 0·45 watt per candle, would give 1,670 C.P. Higher or lower C.P. may be obtained by using other voltages. Typical lamps of this kind are shown in figs. 1 and 2.

Small units of low voltage take currents of 10 amperes or less and voltages as low as 4 or 5 volts. The efficiencies with 1,000-hour life range from 0·6 to 1·0, or even 1·25 watts per candle, according to the current used. These lamps are adapted for series street lighting on 6·6-ampere circuits (at 0·6 to 0·7 watt per candle), for stereopticon lamps, automobile headlights and in general wherever a source of high intrinsic brilliancy, steadiness and white colour is needed.

Large units (several thousand C.P.) to run on standard lighting circuits (110 volts) have efficiencies of 0·5 watt per candle or better. With smaller units the efficiency is ordinarily not so high.

A lamp of this type is illustrated in fig. 3.

The temperature of the filament being 400° to 600° higher than that of ordinary lamps, causes the light to be of a very much



FIGS. 1 & 2.—LOW-VOLTAGE LAMPS. FIG. 3.—HIGH-VOLTAGE LAMPS.
HIGH-EFFICIENCY NITROGEN-FILLED LAMPS.

whiter colour, so that it comes closer to daylight than any other form of artificial illuminant except the D.C. arc and the special Moore tube containing carbon dioxide.

Special colour screens are being developed which, when used with this light, will give a true daylight colour. The screens which will accomplish this purpose will absorb from 65 to 75 per cent. of the light, so that the net efficiency will be about 2·0 watts per candle for a pure daylight colour. At present, to accomplish this purpose with ordinary tungsten lamps, screens must be used which absorb so much light that the net efficiency is between 10 and 12 watts per candle.

At the operating temperature of the nitrogen-filled lamps the intrinsic brilliancy of the filament is about 1,200 C.P. per sq. cm. In ordinary tungsten lamps, on the other hand, running at about 1·25 watts per candle, the filaments have a brilliancy of only about 150 C.P. per sq. cm. The brilliancy of the filament of the nitrogen lamp is thus about eight times that of the ordinary lamp.

This feature, combined with the high degree of concentration preferably used, renders these lamps particularly useful for projection work, such as for headlights or for stereopticons. It is often possible so to design these lamps that their ampere-volt candle-power characteristics remain practically fixed during the greater part of their life. The lamp usually fails by the breakage of the filament with the candle-power well above 80 per cent. of its original value.

The efficiencies that have been given represent watts per mean horizontal candle. The ratio of mean spherical to maximum horizontal (practically mean horizontal also) candle-power has been found to average about 84 per cent. for the lamps made with single loops of helically-wound wire.

The method of photometry adopted for nitrogen-filled lamps is to regard temperature as the fundamental variable.

The temperature has been defined by the equation—

$$T = 11{,}230/(7{\cdot}029 - \log H),$$

where T is the absolute temperature and H is the intrinsic brilliancy of the filament in international candle-power per sq. cm. (projected area).

A most useful criterion for equality of temperature of tungsten filaments is that of colour match. A little practice with the Lummer-Brodhun photometer enables one to judge equality within about 5° if the illumination is good. The most convenient way of setting up temperature standards is to select a number of well-seasoned lamps of high-voltage type, in which the anchors are tightly pinched on to the filaments, so as to prevent variable cooling effects at the contact. It is best to standardise these, not on a basis of candle-power and filament dimensions, but by the aid of a special lamp with a diaphragm in front of it, which enables one to disregard the end portions of the filament and select a known length of the part which is at uniform temperature. It is thus possible to set up the special lamp at any temperature desired by getting the appropriate candle-power per sq. cm. from the filament. The standard lamps are brought to colour-match with this arrangement, and in this way a set of lamps with known relation between voltage and effective temperature is obtained. The life of the ordinary standard lamps would be very short indeed if they were run at the same temperature as nitrogen-filled lamps. For this work, therefore, the standards cannot be used directly as colour standards. For this reason a most important accessory is introduced in the form of a set of special blue glasses.

Four distinct screens of different intensity are used, and any or all of these may be combined with a tungsten filament run at any temperature, and the result will colour match correctly against another tungsten filament at a higher temperature. Thus one only needs to maintain one standard temperature by means of standard lamps, and that temperature can be so low that great permanence is ensured. The constants for the four glasses once determined, there are available a number of standard temperatures ranging from 2,250° to 3,600° K.

THEORY OF OPERATION OF CRYSTAL DETECTORS.

The well-known "crystal" detector now so extensively used in wireless telegraphy employs such materials as silicon or galena in more or less loose contact with brass or other metals and depends for its efficacy as a detector on what is apparently a rectification of the high-frequency aerial current. In his "Principles of Wireless Telegraphy," Prof. Pierce states that the action of the crystal detector cannot be taken to be thermo-electric since the rectification is generally greater than can be attributed to thermal action, and in many cases gives a current opposite in polarity to that which would be produced by thermo-electric action. Similar conclusions were reached by L. W. Austin, who, in 1908, published his tables showing the actual rectification obtained under various circumstances with various contact detectors. Austin pointed out, however, that the rectified currents received in his experiments were generally proportionally to the square of the alternating currents reaching the detectors—a fact which suggests thermal action.

In a recent issue of "Modern Electrics," V. C. Wynne describes experiments which lead him to believe that the action of crystal detectors is really thermo-electric, and due to temperature differences across imperfect contacts. His experiments were conducted with silicon and brass, though many other combinations were tried to some extent. In working with experimental forms of detectors, with two or more pairs of contacts in series or parallel, it was found that the relative sensitivity of one set of contacts varied considerably with adjustment and, at times, the rectifying action reversed, so that one set of contacts opposed the other. After a number of tests yielding negative results, it was found that the polarity of rectification depended upon the nature of the contacts at each side or end of the silicon. Using a lump of silicon X, fig. 1, held between two brass springs, in series with two other detectors Y, Z (the adjustment of which was not changed during the experiments), it was easy to determine the relative polarity of rectification of the experimental detector. The total pressure on each side of X was necessarily equal, but by slightly rocking X it was found possible to get zero or right or left rectification at will. Definite direction of rectification could be obtained by making the area of contact of the silicon with the brass, greater on one side than on the other, and it was, therefore, possible to maintain constant polarity by clamping the silicon firmly to one strip (see fig. 2), and providing a small loose contact on the other side.

The arrangement shown diagrammatically in fig. 3 was designed to test different contacts for thermo-electric effects. The brass arms were made movable, so that any part of either arm could be heated by a bunsen burner without heating the other arm, and it was found that there was a pronounced pyro-electric effect across the loose contact when either the silicon or the brass was hotter than the other contact member. When heat is applied to a firm junction there is some thermo-electric effect, but this is much smaller than the current produced by temperature difference across loose contacts. Using silicon and brass, current always flows from the hotter to the cooler contact piece, but in the case of zincite and brass, or galena and brass or steel, current flows from the cooler to the hotter member. Between silicon and brass, the current thus generated is sufficiently great to be detected by a galvanometer of moderate sensitivity.

From these experiments, it appears that the action of crystal detectors depends on the heating of the loose contact by the high frequency aerial current (this heating being proportional to the square of the current received), setting up a temporary direct current which flows through the detector's local circuit (including the receivers). At each break in the received current there is a temporary redistribution of heat at the detector contacts, so that the D.C. impulses through the telephone are varied with the period of the sending apparatus, and yield a corresponding tone in the telephone.

With a single silicon-brass detector (as at X, fig. 2), the "generated" direct currents flow from the silicon to the brass, and if additional detectors be mounted as at Y and Z, these also appear to act as heat rectifiers of the received high-frequency impulses, and to deal with the half waves which do not pass through X. Hence, though Y and Z are not in series with X so far as concerns the high-frequency current, they generate direct currents which act in series with that produced at X.

From further experiments conducted by Wynne, it appears that the current flowing between the loose contact points (as distinct from the ordinary thermo-electric action of connected pairs) of various couples flows in the direction shown by the following table:—

Couple.	*Direction of Current Flow.*
Copper.—Copper.	Hotter to colder junction.
Copper.—Iron at moderate temp.	Cold copper to warm iron.
at high temp.	Hot copper to cooler iron.
Iron.—Iron.	Warm iron to cold, *or* warm iron to very hot iron.
Steel.—Silicon (moderate temp.)	Hotter to cooler junction.
Steel.—Antimony (moderate temp.)	" " "
Silicon.—Antimony.	" " "
Antimony.—Brass.	" " "
Galena.—Antimony.	Cooler to hotter junction.

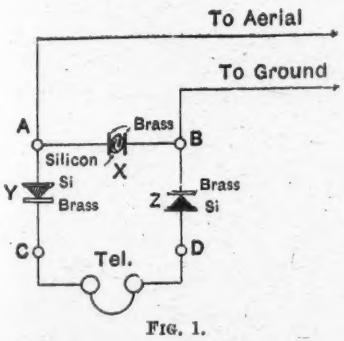


Fig. 1.

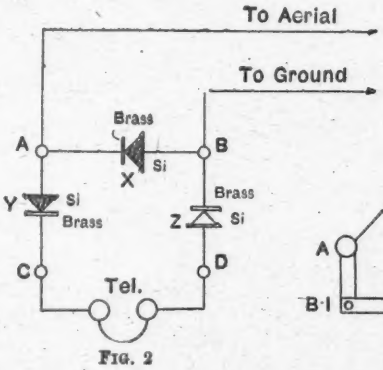


Fig. 2

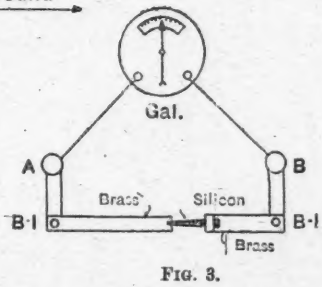


Fig. 3.

FORMULÆ FOR ESTIMATING SLEET LOADS.

The information published by meteorological bureaus makes possible a sufficiently accurate estimation of the stresses likely to be set up in aerial lines by wind pressure and temperature changes, but arbitrary rules have hitherto been depended upon in estimating the probable stresses due to the collection of ice on conductors. During a severe storm in January, 1912, some 300 or 500 poles were destroyed, and from 500 to 700 miles of line wire were brought down in the neighbourhood of the city of Portland (Oregon). A persistent light rainfall, unaccompanied by wind, and falling on to conductors at 28°-30° F., formed a destructive ice covering, and the continuation of low temperature made possible a systematic study of the form and dimensions of the coating on various wires. From an interesting report in the *Engineering Record*, dealing with this investigation, we reproduce the following conclusions:—

It was found that the ice coating formed in an eccentric position above the wires, as shown in the upper sketch, page 764. Due to the heating of the power and lighting wires subsequent to the storm, the ice sheaths were loosened and swung round, as shown in

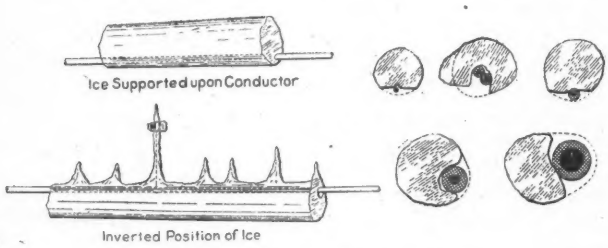
the lower sketch, icicles which had formed from the "drip" now pointing vertically upwards. The thin wall then holding the ice gradually melted, and strips of ice, typical sections of which are shown in the figure, fell to earth. Telegraph and telephone lines naturally did not free themselves in this manner, and lengths of ice had to be broken away from them for purposes of observation. Some of the original section of those fragments

TABLE I.—Size and Weight of Ice Coating for Different Kinds of Wire.

Wire.			Ice.		
Gauge. No.*	Kind.	Overall diameter.	"Corrected" area. Sq. in.	Wt. lb. per linear ft. of wire.	Mean dia. of sheath.
12	Bare	·080 in.	·745	·299	·980
14	W.P.T. phone	·210 in.	1·184	·473	1·250
8	Weatherproof	·262 in.	1·329	·531	1·300
4	,,	·500 in.	1·466	·585	1·430
4/0	,,	·709 in.	1·791	·715	1·600
14	2-wire twisted	each ·210 in	1·141	·456	1·320

* Corresponding S.W.G. Nos. are 14, 16, 10, 5 or 6, 6/0, 16.

which had melted away from the heavier current lines, had, of course, been lost, but there was no difficulty in forming a reasonable estimate of the original contour of the sheathing (see dotted lines in sections herewith).



Ice Coatings on Overhead Wires.

Table I summarises the data obtained by examination of ice collected from various lines. It will be found that the area of (wire + ice sheathing) (corrected as above) = $K \times \sqrt{d}$ where d = diameter of wire and K = from 2·36 to 2·64. The circumstances under which ice was recovered from the No. 4-wire made it probable that insufficient correction was made for loss of ice by melting; excluding the data relating to No. 4-wire, K = 2·646 as mean value with a maximum departure of 2·1 per cent. therefrom for other gauges. This relationship is confirmed by the fact that the mean diameter of ice developed, $D = k \times \sqrt[4]{d}$ where k = 1·812 (maximum departure 3·7 per cent.).

The American I.E.E. Committee on overhead line construction has recommended that for design purposes ½ in. ice coating be assumed all round conductors; the actual ice load carried by the Portland lines was practically identical with that corresponding to the above rule and, as the conditions were, if unusual, not unique, it appears that the American standard rule does not provide a sufficient factor of safety.

INSTITUTION OF ELECTRICAL ENGINEERS.

Manchester Local Section.

On Tuesday last Prof. E. W. Marchant, D.Sc., the new chairman, read his inaugural address, of which the following is an abstract:—

It seems to me that the time has come when it might be advantageous to look round at the vocation of an electrical engineer, to see what he has accomplished and to make an attempt to determine the place he should fill in the industrial world, and of the steps which may appear possible to improve his status, and the reward he should receive for the long and arduous training through which he has to pass before he can be regarded as a fully qualified member of his profession. My chief reason for discussing this subject is that the electrical engineer to-day is a very specialised person. Electrical engineering has developed so rapidly and in so many directions that it is now impossible for one man to keep in touch with what is happening in all the branches of activity in which electrical engineers are employed. Each man becomes obsessed, and very rightly so, with the work for which he is responsible; he busies himself in becoming acquainted with the technical development of his subject, and there is, I think, some danger that the "human" aspect of his profession may become forgotten and may be neglected. It is also opportune at this time to discuss the subject, because the Institution has recently organised a system of examinations to test the quality of the candidates who wish to join its membership. The examination scheme has been designed to test the knowledge of the candidate and to avoid, as far as may be possible, the respective member cramming for it; those who have had experience of this work know how difficult it is to achieve this end, especially after the examination has been in operation for some time, and it is the hope of a good many of those engaged in educational work that besides showing ability to pass an examination, the prospective candidate should also give evidence of having passed through a recognised course of instruction in some approved institution.

The examination is a step in the direction of attempting to provide that members of the Institution shall really understand the principles underlying the work in which they are engaged, that their work should not be done merely by rule of thumb, that there should be given evidence of capacity to think. To produce men of this kind is the object of all the universities and technical colleges of higher grade. It is to be hoped that the establishment of the new examination scheme may lead to a closer connection between the Institution and the chief training colleges, a result which should prove of much ultimate advantage to both. The electrical engineer, like every other member of the civilised community, has to take a place in the social structure; his position must depend (and here I do not mean his position in any narrow sense) on his recognition of the position his labours take in the work of the world. On the recognition of this fact by the world at large depends his future, not only from the point of view of influence, but also financially, and it is from this standpoint that I wish this evening to take a brief survey of his position.

The construction and supervision of stations for the supply of electric power must always provide occupation for a considerable proportion of electrical engineers. The running of a small station requires a comparatively small amount of general knowledge of electrical engineering principles. The ideal central station engineer is one who must possess a great variety of qualities; not only must he be a good engineer, but also a good man of business.

The central-station engineer is destined, in the future, to take a still more important place in the life of the community than he occupies at present. The remuneration offered, however, to those taking up this work is quite inadequate to its responsibility. Successful central-station engineers, in all but the largest cities, have, in many cases, forsaken their positions to take up consulting work, and are retained by their former employers as consulting engineers. It would surely be better worth the while of most central-station authorities to have at the head of affairs men of experience who would be able to do all the necessary work for the central station, without calling in outside advisers. If this is to happen, it must be made worth the while of the central-station engineer. It is significant that the salary offered to those who wish to enter some of the power companies has increased to a most marked extent during the last year or two, due to the fact that the supply of men has rapidly fallen off. I heard the other day of a case in the West of England, where an engineer who, years ago, had dozens of men on his books who were anxious to get into central-station work, now had none. The list of vacant positions in the electrical journal advertisements is more than twice as long as that of men wanting employment. This is a very healthy sign and a hopeful augury for those who have started in this profession. If the office of electrical engineer to a town or city is to become one of increasing honour and importance, it is essential that it should be filled with thoroughly trained men. I do not wish, here, to lay great stress on college education, though that, in the view of educationists, is an essential element in the training of such people; but that they should be persons of good general knowledge and high intelligence, that they should be competent, when the time comes, to assume the greater responsibilities which will rest upon them. To attract such men it is essential that these positions should be made financially remunerative. One cannot expect a man of promise to be content to spend 10 years of his life preparing for a profession which in the end will yield no adequate return for his expenditure of time and money.

A panel doctor with 1,200 patients receives a fixed income of at least £360 a year, and this may be regarded as a minimum salary for a qualified medical practitioner to-day. The training through which an electrical engineer engaged in central station work now has to pass, with three years at college and three or more years at works, is as exacting as that which a doctor receives. Surely such a man, whose work affects the life of the whole community, deserves as ample a recompense as the man who treats a limited fraction of its members.

The electrification of railways seems likely to be the direction in which the most important developments will take place during the next few years. The electrical engineer who intends to go in for railway work has, apparently, a great opportunity. It behoves the electrical engineer who looks on his work as his future vocation to equip himself with a thorough knowledge of railway conditions. Take two obvious examples: The arrangement of a schedule of trains for a suburban line is a problem of some mathematical complexity; the estimation of the power taken by an electric locomotive on a given line of road entails a large amount of detailed calculation and a thorough knowledge of mechanical principles. For this class of work the necessity for a good general engineering training is obvious, but, given this essential training, the field of the electrical engineer in railway work becomes a very wide one. As electric railways progress, it seems certain that the position of mechanical engineer to a railway will be filled by an electrical engineer, and if the success that has attended the promotion of engineer to the position of general manager of a railway has the effect one may reasonably anticipate, the electrical engineer may regard as a legitimate aspiration that he should be called on to fill this great administrative position.

The greater number of men with whom we, in the universities and technical colleges, have to deal, find their way to the manufacturing firms, and a considerable proportion of the membership of the Institution is engaged in the design and manufacture of electrical machinery and apparatus. The equipment of the engineer

intending to take a responsible position with a large firm has to be, from the technical standpoint, more complete and thorough than that required in any other branch of electrical engineering. It is easy enough for men who have had college training to enter works at the present time; most manufacturers seem only too anxious to obtain their services, and a living wage is paid from the start, but the number of openings that are better paid is much less numerous. There is a great gulf fixed between the men who are "just" on the staff and those in leading positions in a works, and in the long interval that might elapse before one of the former class becomes eligible for the higher positions, there is a period of great difficulty for most engineers in which the best men feel that they are wasting their time. In some cases, men have left the profession, who would otherwise have proved themselves a valuable addition to it. The main point that I would urge is that this condition is a discouragement to many able men, who might otherwise have entered electrical engineering, and have done much to advance it. I was discussing this matter the other day with a man in a good position with one of the best electrical engineering firms in the country, and he gave me his opinion that in his firm a man of initiative and energy might hope by the time he had reached, say 35, to receive a salary of £300 a year; I think all will agree that this prospect is not such as to attract into electrical engineering the bright minds and keen intelligence which it is so essential for the welfare of the industry should be attracted. Even in the early days of an engineer's career in a works, his remuneration is less than it should be. I know of one firm who offer a college-trained man, who has served his apprenticeship, 30s. a week to start with; a mechanic who has served his time can get 50s. What is the result? The only men who go to this firm are those who want to get practical experience, and are on the look-out for a better post from the start. The best men leave almost at once; the men who are not worth much remain. The manufacturers have been in a very strong position in the past, because the supply of trained men on which they could draw has been large; now conditions are changing, and I would urge, as strongly as I can, that in order to attract the best type of persons into the profession of electrical engineering, the standard of remuneration for technical men must be advanced. Surely it is to people of this type that a manufacturer must look far more than to any other for the progress and advance of his business, and it is of the greatest importance to him to ensure that such people shall be forthcoming in the future. The prospects of the manufacturer to-day, I believe, are better than they have been at any time during the last decade. It is, therefore, a suitable time at which to urge this matter, and to lay stress on the necessity of ensuring that the prospects of those entering an electrical engineering works shall be at least as good as those in any other branch of engineering practice.

The operating branches of telegraphy and telephony are under the control of the Government, and, as in other branches of the Government service, the position of its engineers is not as satisfactory as it might be. It is to be hoped that the higher administrative positions in this service will in the future be more open than they appear to be at present to those who have a thorough knowledge of the technique of telegraphy and telephony. The advance in status of the trained electrical engineer should lead, before long, to a recognition of his fitness for such administrative positions. It is only by a complete co-ordination of the technical and administrative sides of this undertaking that the greatest economy and efficiency can be reached; if that end is to be attained the electrical engineer must be ready and fully equipped for administrative work. To get the right kind of person, the engineering side of telegraph and telephone engineering must be made attractive enough to ensure that the most able people shall think it worth while to become telegraph engineers. The case for improved conditions in the telegraph service is overwhelming. The importance of the service of the telegraph and telephone to the community to-day demands that those engineers engaged in its direction shall receive recognition at least equal to that given to those responsible for any of the other great national services.

The application of electrical energy to chemical manufacture has made great strides during the last decade, and the price at which electrical energy can now be sold makes it evident that electrochemical processes will come even more extensively into use, not only for the manufacture of alkalis, carbides, and the like, but also for smelting iron and steel. The questions involved in the application of electrical energy to purposes of this kind are essentially engineering problems. Electrical engineers should find a considerable field for their activities in this direction, and one of the advantages this branch of engineering possesses is that it is likely to be rapidly progressive as the cost of electrical energy decreases. It is to be hoped that this work will not be left in the hands of those more directly concerned with chemical problems, as progress is much more likely to be rapid if the mechanical design of the plant is sound. A thorough engineering training, combined with a good knowledge of chemistry, is provided in most of the larger technical schools and colleges. It remains for the users of these processes to employ the raw material that is being produced.

The consulting engineer has been consigned by some people to a speedy end, as far as electrical work is concerned, his place being taken by engineers employed by large firms. It will, however, be a long time before the consulting engineer finds himself without occupation. Consulting engineering as a vocation can, however, hardly come within the scope of this brief survey, since a consulting engineer is necessarily a man who has had experience in one of the branches of engineering to which reference has been made already. I have made some attempt to classify the membership of the Institution with a view to finding the proportion engaged in each branch of work. The classification is very incomplete, and has been applied only to the class of members. The thing that has surprised me has been the apparently large proportion of men engaged in the business of the supply of electrical power, who are members of this Institution. That, of couse, is the greatest work at the present time, but it is one which will not, I believe, tend to increase very rapidly as an employment for engineers. The tendency to-day is towards large power stations and long transmission lines; anyone who has seen the large power stations in Canada and the States, especially those operated by water, cannot but have been impressed by the very small number of engineers which a station of, say, 50,000 KW. requires.

The first conclusion one arrives at from this classification is that there must be a large number of electrical engineers engaged in manufacturing and constructional work who are not members of this body. These men are of great value to an institution such as ours, because it is they who are really in the fore-front of discovery, and I hope an effort will be made to bring men of this type into the ranks, as they cannot fail to strengthen the membership.

The electrical engineer of the future must be a person who can take a broad view of his profession; whether he be engaged in central station work, in manufacture, telegraphs, railways, or as a consultant, he must be able to see all sides of a question. He must be able to solve new problems along sound lines. If men of this kind are to be available as electrical engineers, it is essential that the best type of person must enter the profession. The position to-day is critical, and on the attitude of the industry to its engineers depends the future of the electrical engineer. The magnitude of the tasks that lie before him, the complexity of the problems he has to solve, the greatness of the results he can achieve are unequalled in any other calling. For the best results the best men should be got, and whether the best men enter electrical engineering depends entirely, or almost entirely, on whether it is made worth their while to do so.

As far as one outside the industrial world can judge, the prospects of the electrical engineering industry at the present time are exceedingly good; they are even better if one takes into account the openings that are available for those willing to go abroad; it behoves the electrical engineer, then, to make use of his opportunities, and to see to it, as far as lies in his power, that there may be great difficulty in obtaining really competent and well-trained electrical engineers at too low a rate of salary. It must be acknowledged that the income derived at the present day by most electrical engineers from their profession is generally not high enough, considering the importance of the work they have to perform.

The matter is one of supply and demand; the supply hitherto has been ample, the demand meagre; now, demand is overtaking supply, and the necessary consequence to an increased demand is either a worse quality of product, or a higher price.

It is to be hoped that the members of this Institution who have it in their power, will see to it that it is the latter alternative that is chosen by the electrical engineering industry.

POWER TRANSMISSION AT COLLIERIES.

A JOINT meeting of the Scottish Branches of the NATIONAL ASSOCIATION OF COLLIERY MANAGERS and the ASSOCIATION OF MINING ELECTRICAL ENGINEERS was held on October 25th, in the Royal Technical College, Glasgow, when a paper, by Mr. W. H. Telfer, of the Wilsons & Clyde Coal Co., on "Power Transmission at Collieries," gave rise to a lengthy discussion.

The author said that transmission of power by electricity easily took the premier place, and was cutting out to a large extent the older methods. Electricity was now being successfully used for operating all classes of mining machinery, with the exception of reciprocating drills and holing machines, and there were cases now of entirely electrically-equipped collieries.

Speaking generally, fairly large collieries, or groups of collieries, requiring generating plant of 400 KW. and upwards, should have their own plant. The ideal plan was to have steam winding engines, the fan driven by a compound engine, and possibly the washer driven by a compound engine, all exhausting into a mixed-pressure turbo-generator producing power for the operation of other machinery where that was being done electrically.

Where the maximum power required would be under 200 KW. and the load factor not likely to be good, and the colliery did not form one of a group, power could be got from a supply company on better terms than it could be produced at the colliery. He based these opinions on the prices charged by one of the large power companies in Scotland. This ran out about 0·7d. per unit, and where about 50 per cent of the power was used in fairly continuous pumping or ventilation plant, the average would be 0·6d. per unit. For actually continuous pumping the figure would come as low as 0·4d. per unit. Buying from a power company had a great deal to recommend it, especially where the consumption of current was irregular and the power factor low.

Whether the system should be a three-phase or continuous current one depended on local conditions. Where the load was mostly pumping, auxiliary fans, and endless rope haulages, it was certainly a case for the three-phase. Where the load was mostly intermittent, such as coal-cutters, main and tail rope or single dook rope haulage, or winding from blind pits, continuous current was preferable. The pressure would depend principally on the length of transmission; where this did not exceed one mile and the amount of current was not great, a medium pressure was generally most suitable. Where large

currents would be required, even with short transmission, it might be advisable to have high pressure. With the adoption of the best type of plant and methods, and reasonable precautions, the dangers of electricity could be guarded against, and accidents reduced to a minimum.

As regarded the ignition of gas or dust by electricity, there were certainly some mines, but very few in Scotland, where the use of electricity at the face would not be judicious. In the great majority of their Scottish mines worked with safety lamps there was no objection to the use of electrical power right up to the working face. If proper precautions were not taken, fire was a more likely cause of danger in the Scottish mines, than ignition of gas or dust. Fire might be caused by defective or damaged cables, bad joints, defective switchgear, or excessive sparking. To minimise this danger, only the best class of cables and switchgear should be used.

Mr. Frank Onslow, Glasgow, wrote that compressed air should be regarded rather as the ally of electrical power than its enemy. There were many positions in which the use of compressed air was preferable to electricity, and to press the adoption of electrical power under such circumstances was only eventually to prejudice its further use.

THE RIGHTS OF SUB-CONTRACTORS.

[FROM A LEGAL CONTRIBUTOR.]

The case of Babcock & Wilcox *v.* the Metropolitan Water Board, which was decided by Mr. Justice Channell on October 27th, has a most serious bearing on the rights of those who undertake part of the work which is to be carried out under a large and varied contract. As the learned Judge himself said when he began his judgment, the case was more important that those which are usually found in the non-jury list. The material facts were these.

By a contract in writing made in 1907, the Thames Iron Works agreed to construct for the defendants certain water-works plant at Walton-on-Thames including (*inter alia*) 10 Babcock & Wilcox boilers, an electric coaling crane, an electric ash hoist, ash railway and two economisers. It was provided by the contract that payment for the boilers, &c., above referred to should be made as follows :—

"20 per cent. of the amount of the contract price of each boiler on completion of their principal vessels, tubes, forgings and castings ; 20 per cent. on the delivery of the above ready for erection ; 20 per cent. during the progress of further delivery and erection at the discretion of the engineer ; 20 per cent. on the delivery, completion and starting of the boilers, &c. The remaining 20 per cent. will be paid seven months after all the plant in this contract has been started." On December 5th, 1907, it was alleged that the Thames Iron Works assigned the contract for the supply, delivery and erection of the above goods to the plaintiffs. In a letter of that date they said :—"Subject to the approval of the Water Board we have pleasure in accepting your offer of July 20th last to supply the 10 boilers for the above pumping station . . . . for the sum of £12,250 . . . . delivered and erected in place. The whole to be to the approval of the engineer of the Metropolitan Water Board and ourselves, drawings to be submitted and approved before the work is put in hand, and it is understood you relieve us of the entire responsibility with regard to that part of the plant included in this order. Delivery, erected complete, on site, 10 months from date. Payments in accordance with the scheme of the Metropolitan Water Board less 2½ of my account." Similar letters were written on the same date with regard to the economisers, the coaling crane, the ash hoist and the ash railway.

The plaintiffs alleged that the fact of this assignment was well known at the time to the defendants, and that in any event formal notice thereof was given on May 21st, 1912.

In that letter the plaintiffs said :—"As you are no doubt aware we took over from the Thames Iron Works that portion of the contract relating to the supply of boilers, &c., with all its responsibilities, and as the payment of the balance of our supplies is due . . . . we claim £3,134 7s. 6d., being the amount due to us under the arrangement with the Thames Iron Works, plus a bonus in accordance with the conditions of the contract, which we calculate on the basis of the tests made to be 4·4 per cent.

The goods were duly delivered and erected, payments being made from time to time to the plaintiffs by the defendants through the Thames Iron Works. The total amount so paid was £12,073, leaving a balance of £3,314 7s. 6d., which the plaintiffs now sought to recover.

The defendants, by their defence, did not admit the assignment, or that the letter of May 21st, 1912, constituted any notice of assignment. They pleaded that the contract in question was divided into two parts, and that what was alleged by the plaintiffs to have been assigned to them was only a portion of the work in Part II. They further said that payments on account of the boilers, &c., were included in payments on account of all goods supplied and all work done under the contract, and that all the amounts due and payable to the contractors under that part of the contract had already been paid. They admitted being aware that certain of the contract works were sublet by the contractors to the plaintiffs, but denied that the amount alleged, or any amount, was paid by them to plaintiffs. They further said that in making payments on account they had not differentiated between work done by the contractors by means of subletting to the plaintiffs and work done by the contractors otherwise. They further denied paying the plaintiffs through the contractors. After considerable discussion, Mr. Justice Channell came to the conclusion that the claim failed. It had not been established to his satisfaction that the plaintiffs had any claim in law against the Metropolitan Water Board, their right being to proceed to recover the amount due from the liquidator of the Thames Iron Works.

It is sometimes said that hard cases make bad law ; and this certainly appears to be one of them. That the Board have the benefit of the work was admitted, and it was clear from the documents that Messrs. Babcock & Wilcox were virtually in the shoes of the Thames Iron Works so far as the certain portions of the work were concerned. We hope to advert to this case again in a future issue when we have been able to ascertain the exact grounds upon which it was decided.

NOTES FROM CANADA.

[FROM OUR OWN CORRESPONDENT.]

Although overhead wires will not be banished from the streets of Canadian towns and cities for a good while yet, it is evident that underground work is receiving some attention, as three cities have recently ordered an aggregate of nearly 20 miles of underground cable. The Electrical Service Commission of Montreal has announced that all the overhead wires and cables on St. Catherine and Blenny Streets will be replaced by underground wires by next May, and has further suggested that buildings in future should be wired suitably for connection to underground services.

The Abitibi Pulp and Paper Mills Co. have recently erected new mills at Iroquois Falls, Ontario, in which motors totalling over 2,000 H.P. are being installed.

The Hydro-Electric Power Commission of Ontario is arranging to supply Eastern Ontario with electric power, which it intends to buy from the New York and Ontario Power Co., of Waddington, N.Y. It is intended to cross the St. Lawrence River at Morrisburg, which is about 50 miles south-east of Ottawa ; the towns of Morrisburg, Prescott, Winchester, Chesterville Russell, and others in the vicinity, will soon be receiving power. The City of Kingston, as reported in these notes some time ago, voted against obtaining power from the Commission, and decided to extend its existing steam plant, but now that other places in this district are about to be supplied, the matter is to be opened once more, and the Commission approached again.

In South-Western Ontario the matter of light railways to serve the towns and villages has been very much before the public for some little time, and recently a meeting of delegates from various municipalities met in Toronto to hear a report read by the Hon. Adam Beck, chairman of the H.E.P. Commission, on this subject, which had been prepared by the Commission's engineers. Five plans had been considered, the construction cost being estimated at about £7,000 per mile ; the revenue would be obtained from

passenger traffic, freight traffic, milk carriage, mail and express and advertising receipts. It is proposed that the line should be built by the municipalities interested, and operated by power bought from the Commission. Power users along the route would probably be able to obtain power at prices ranging from $5 to $17 per H.P.-year. The report referred to above is being printed in order that interested parties may be able to look thoroughly into the whole subject.

At a meeting of the Ontario Municipal Electric Union held recently in Guelph, the following resolution was passed unanimously :—"In view of the comprehensive scheme outlined by the Dominion Government for the erection and improving of waterways in connection with the St. Lawrence River, Welland Canal, French River, Sault Ste. Marie, Trent, Ottawa and others, involving the large expenditure of public money, and in view of the extensive developments which are possible in consequence thereof, also in view of the power requirements of the province, be it resolved that this Association request the Dominion Government to put such water-powers under the jurisdiction of the Hydro-Electric Power Commission of Ontario, to be developed by them for the use of the municipalities of the province for the benefit of the people."

The contract for the electrification of the Mount Royal tunnel at Montreal, which is to form the Canadian Northern Railway Co.'s entry to that city, has recently been let. The cost of this work will be about £100,000. No Canadian Northern steam locomotives will go into the city ; these will be exchanged at a point some distance away for electric locomotives, which will then run the trains through the tunnel and thence into the station. It is anticipated that the boring of the tunnel will be completed before the end of the year. According to the daily papers, Sir Thomas Shaughnessy, president of the Canadian Pacific Railway, has given it out that if the electrification of the Rocky Mountains division, which is now being carried out as an experiment, is a success, the entire railway will be electrified. It is stated that the Rocky Mountains section presents every problem of handling traffic known to railway men, and that if electric locomotives can deal with them all successfully, the changing over of the whole line from steam to electric operation is certain to follow.

THE CHIEF WHO HAD A BRAIN WAVE.

By IGNOTUS.

Now, it came to pass in the city of the Brobdingnagians, which is in the region of No Man's Land or thereabouts, that there was much tribulation among the population, for, verily, the streets were in a constant state of turmoil, insomuch that it was with much difficulty that even a coster's cart could proceed thereon, and the reason for this was that there were many councils and authorities in that city, and each of them had great and pressing matters in connection with the highways and byways of that city. There was one authority which was known as the Company of Water Bearers, and they had great powers in the laying of pipes, both of lead and iron, and they employed cunning workmen in divers metals to bear the water to the inhabitants of that city. Likewise, also, there was a company which carried strange sounds of music and of speech along wires, so that each inhabitant could converse one with the other over great distances while reclining at his ease. This authority was of great power and wisdom, and had taken down its overhead system, and the posts and poles thereof, and had placed the wires under the highways and byways, so that no man could see them. Also there was the great and mighty authority which purveyed heating, lighting and power to the inhabitants of that city by the agency of electricity at prices of ·5d. or thereabouts, and this again made many connections, so that traffic was much disturbed thereby. Furthermore, there was a very powerful and much-to-be-feared company, which purveyed gas unto the inhabitants, and these authorities and their servants did strive mightily one with the other, for as much as they all wished to take up all the roads at the same time, and the inhabitants of that city suffered.

Now, it came to pass that upon an occasion the chief of one of these authorities had a brain wave. This malady is most intense, and resembleth a species of calenture or sleeping sickness, and yet also possessing the properties of extreme fever, and its malignity while it doth last is most marked. Being therefore in this species of madness, the chief collected the other chiefs together and spake unto them, Behold now, the people of this city are risen up against us, for as much as their traffic is impeded and they may do us a great violence. Therefore now, go to, let us deal subtly with them and remove this grievance from among their midst, lest peradventure they turn upon us and rend us. Let us now consider whether it be not possible to co-ordinate our acts so that we be not continually destroying the pavements and the foundations of the city and of the houses thereof.

And this saying pleased the other chiefs greatly, and they spake unto him saying, Verily thou hast spoken wisdom. Let us now draw up a system whereby these evils may be abated. And they drew up a system whereby that whenever it entered into the mind of any chief to pull up the pavement, he should previously inform the other chiefs, saying at such a date and in such a place I shall uproot the street and destroy the pavement, and dig a trench and obstruct the traffic. If, therefore, thou wishest to perform the same act, let us join ourselves together and we will make one muddle of the whole thing. And thus it was agreed among them.

But there was in that city a still greater authority which was elected of the people, and the members of that authority were of great wisdom and power and might and understanding as befitted the representatives of that city, and owing to their rotundity they were named the Corporation. Now this matter came before the meeting of the Corporation, and the members thereof were greatly wroth, inasmuch as this action had been taken without their consent and sanction, and there was in that Corporation a Labour Member, and he arose, saying, What is this evil that is come amongst us, for, verily, if these authorities and these powers conjoin together to uproot and to destroy, there will be great economy of labour, for as much as one man can destroy as much as six could previously, and there will be many thrown upon the rates. Therefore let us now forbid these authorities to conjoin together and inform them that each must carry out their work separately, for Labour must be fed. And a great writing was inscribed upon the books of the Corporation, and it was so.

And to this day the powers and the authorities of the city of the Brobdingnagians do each and separately root up and destroy and dig trenches and lay cables to the great inconvenience of the inhabitants thereof, for as much as Labour must be fed ; and the inhabitants of that city do languish exceedingly.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"B. of T." writes : "I shall be greatly obliged if you will be so kind as to furnish me with the following information concerning the B. of T. regulations for overhead L.T. 250-volt bare wire transmission lines :—(1) When feeders and distribution mains are supported by iron brackets attached to the sides of houses, is it necessary for the wires to be kept above 7 ft. away from the building ? (2) Should the house service wires be insulated ? (3) what is the maximum distance apart that these brackets may be placed ? (4) When running wires across private fields on wooden poles, is there any limit enforced to the distance apart of the poles ? (5) I should also be glad to know in what section of the Electric Lighting Act the regulations for these lines are given in full.

*** As to (1) Rule 7 of the Regulation made by the Board of Trade for securing the safety of the public pursuant to the Electric Lighting Acts, 1882 to 1909, provides that service lines from overhead lines shall be led as directly as possible to insulators firmly attached to some portion of the consumer's premises which is not accessible to any person without the use of a ladder or other special appliance. Every portion of any service line which is outside a building, and is within 7 ft. from the building, shall be efficiently protected by insulating material. Rule 18 of the Regulations made pursuant to the Electric Lighting Act, 1888, is in very much the same terms. It will be seen that any service line *within* 7 ft. must be insulated. As to (2) the regulations referred to do not say whether the service lines must be insulated.

(3) The regulations above referred to appear to be silent as to the distance between mural supports, but it is presumed that the limit of distance can be calculated from the regulation as to the factor of safety. "Rule 17: The factor of safety shall be overhead lines at least five, and for wooden poles at least ten, and for iron and steel structures at least six, taking the maximum possible wind pressure at 30 lb. per sq. ft. No addition need be made for a possible accumulation of snow."

As to (4) the regulations provide that "the interval between any two wooden poles used singly as supports for an overhead line shall not exceed 200 ft.; provided that where the line makes an angle at any such pole, the interval between that and the next pole shall not exceed 150 ft. In the case of supports other than single wooden poles, the intervals between the supports shall be such as may be prescribed by the Board of Trade.

As to (5), the "regulations" in question are not part of any Act of Parliament, but are made by the Board of Trade under powers conferred upon them by the Electric Lighting Acts. A copy can be obtained from the King's printers for a small sum.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

23,681. "Device for holding and adjusting the position of electric lamps for use on boats and for submarine purposes." A. BARNES. October 20th.

23,715. "Elements for electric heating devices or radiators." R. A. S. PAGET. October 20th.

23,720. "Electrical resistances and resistance thermometers." W. J. MELLERSH-JACKSON. (H. N. Packard.) October 20th. (Complete.)

23,728. "Radiating system for signalling by electric waves from aeroplanes." SIGNAL G.m.b.H. October 20th. (Addition to 756/13. Convention date, November 27th, 1912, Germany.) (Complete.)

23,739. "Contact-breaker for magneto-electric ignition apparatus." UNION-WERK MEA G.m.b.H. October 20th. (Convention date, December 5th, 1912, Germany.) (Complete.)

23,741. "Substance for use in processes for electro-plating non-metallic objects." L. WALTISPURGER and C. A. RIVOAL. October 20th.

23,754. "Brushes for electric contacts." J. E. COLAS and SOC. D'ELECTRICITE NILMELIOR. October 20th. (Convention date, November 26th, 1912, Belgium.) (Complete.)

23,774. "Electrical fuse or cut-out." E. W. ADAMS and W. EMMOTT. October 21st.

23,845. "Incandescent electric lamps." C. A. HARRISON. October 21st.

23,867. "Rocker-arms and brush-holders for use on electrical motors and generators." J. LEECH. October 21st.

23,892. "Construction of electrically-heated stove." H. S. SOUTTER. October 22nd.

23,897. "Hot-plates and the like electrical heating devices." G. COOPER. October 22nd.

23,903. "Starting-switches for electric motors." J. L. WARBY and H. C. PARSONS. October 22nd.

23,916. "Magneto-ignition apparatus for internal-combustion engines." N. F. HOLDER. October 22nd.

23,917. "Time-limit devices and their applications." J. ROOTHAAN and FERRANTI, LTD. October 22nd.

23,950. "Insulators." M. HENTSCHEL and PORZELLANFABRIK HENTSCHEL AND MULLER. October 22nd. (Complete.)

23,959. "Electrodes for use in the production of nitric oxide." C. ROSSI. (Convention date, October 22nd, 1912, Italy.) October 22nd. (Complete.)

23,976. "System of automatic electrical signalling for railway trains." W. HILEY. October 23rd.

24,006. "Treatment of sewage by electrolysis." J. W. SIMSON. October 23rd.

24,007. "Electric controlling switchgear." E. W. ADAMS. October 23rd.

24,025. "Apparatus for automatically regulating electric circuits." H. LEITNER. October 23rd.

24,026. "System of regulation and control for electric circuits." H. LEITNER. October 23rd.

24,028. "Manufacture of tungsten." C. GLADITZ. October 23rd.

24,029. "Manufacture of incandescent electric lamps." C. GLADITZ. October 23rd.

24,041. "Telephone systems." AUTOMATIC TELEPHONE MANUFACTURING CO., LTD. (Automatic Electric Co., Ltd., United States.) October 23rd.

24,054. "Starting switches for electric motors." V. G. MIDDLETON, F. FARNDON and D. K. MORRIS. (Divided application on 26,912. November 22nd.) October 23rd.

24,074. "Automatic safety shunting devices for electric arc lamps." A. H. RAILING and A. E. ANGOLD. October 24th.

24,089. "Electrically-lighted advertising apparatus." G. FORSTER and S. E. PARKER. October 24th.

24,117. "Oil insulated electrical apparatus such, for instance, as transformers." SIEMENS-SCHUCKERTWERKE G.m.b H. (Convention date, October 24th, 1912, Germany.) October 24th. (Complete.)

24,126. "Geared alternating-current electric motors." SIEMENS-SCHUCKERTWERKE G.m.b.H. (Convention date, October 24th, 1912, Germany.) October 24th. (Complete.)

24,130. "Electric candle lamp." H. GARDE. October 24th. (Complete.)

24,148. "Masts." MARCONI'S WIRELESS TELEGRAPH CO., LTD., and A. GRAY. October 24th. (Complete.)

24,162. "Oil transformers." H. WEISS. (Convention date, October 26th, 1912, Austria.) October 24th. (Complete.)

24,165. "Manufacture of sparking plugs." K. E. L. GUINNESS. October 24th.

24,191. "Dynamo-electric machines." F. M. LEWIS. October 25th.

24,198. "Electric switches." V. HOPE. October 25th. (Complete.)

24,204. "Electric tail-light showing red, for use on cycles and motor-cycles." L. H. SACRE. October 25th.

24,212. "Conversion of alternating electric current." A. SCHERBIUS. (Convention date, October 25th, 1912, Germany.) October 25th. (Complete.)

24,219. "Control of electricity for lighting vehicles." G. INRIG and G. INRIG, LTD. October 25th.

24,221. "Electrical contact devices." J. E. TAYLOR. October 25th.

24,226. "Safety device for use in connection with electric motors." W. ROGERS and J. S. DAVIES. October 25th. (Complete.)

24,246. "Electric incandescence filament lamps." J. R. QUAIN. October 25th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

CONVERSION OF ELECTRIC ENERGY. W. A. Price. 22,524. October 3rd. (Cognate application 22,542, 1912.)

MANUFACTURE OF METAL FILAMENTS. Pope's Electric Lamp Co. (Trenzen.) 22,548. October 3rd.

CIRCUIT CONNECTION FOR ELECTRICAL INSTALLATIONS WITH MIXED LOADS. Landis & Gyr (Firm of). 22,591. October 4th. (October 12th, 1911.)

MEANS FOR SIGNALLING AND CONTROLLING APPARATUS BY MEANS OF ELECTRICAL OSCILLATIONS IN ELECTRIC SUPPLY MAINS. A. C. BROWN. 22,649. October 4th.

CONTROLLING DEVICES FOR ELECTRIC MOTORS. A. H. Curtis, A. H. Mackley and Adams Manufacturing Co. 22,747. October 5th.

ELECTRIC SIGNALLING SYSTEMS FOR RAILWAYS AND THE LIKE. C. W. Ward. 22,833. October 7th.

PRODUCTION OF OZONE. J. R. Quain. 22,854. October 7th.

ELECTRIC ARC LAMPS. F. B. Cannock. 22,952. October 8th.

ELECTRIC DISTRIBUTION FUSE BOARD. H. B. Prentice and H. Atlay. 23,014 October 9th.

ELECTRIC HEATING AND COOKING APPARATUS. R. F. Venner. 23,082. October 9th.

METHOD OF AND MEANS FOR ELECTROLYTICALLY DEPOSITING METAL UPON THE INTERIOR OF TUBES AND OTHER HOLLOW ARTICLES OR THE LIKE. G. P. M. Lee and W. A. Brame. 23,096. October 10th.

TELEPHONIC RECEIVERS. A. Marr. 23,240. October 11th.

ELECTRIC IGNITION APPARATUS FOR INTERNAL COMBUSTION ENGINES. H. Leitner. 23,430. October 14th.

ELECTRICAL HEATING APPARATUS, MORE ESPECIALLY VULCANIZERS. H. R. Nash. 23,451. October 14th.

PROCESS FOR THE MANUFACTURE OF CHEMICALLY PURE TUNGSTEN. C. H. Fischer. 23,475. October 14th.

ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co.) 23,594. October 15th.

TROLLEY POLES FOR TRAM AND LIKE CARS. A. K. McQuade. 23,639. October 16th.

CLIPS FOR ANCHORING ELECTRIC TROLLEY WIRES FOR TRAMWAYS AND THE LIKE. A. Welsh. 24,522. October 26th. (Cognate Application 6,296, 1913.)

APPARATUS FOR PERIODICALLY TESTING ELECTRIC CURRENTS. C. Smith. 24,960. October 31st.

HEATING OR LIGHTING APPARATUS. H. J. C. Forrester. (Rector Gas Lamp Co.) 25,813. November 5th.

ELECTRIC ARC LAMPS. British Thomson-Houston Co. (General Electric Co.) 28,122. October 5th.

ELECTRIC MOTOR-METERS. British Thomson-Houston Co. and F. Holden. 28,227. December 6th.

CONTACT OR COMMUTATING DEVICES FOR ELECTRICITY METERS. S. H. Holden and Chamberlain & Hookham, Ltd. 28,316. December 9th.

ELECTRIC TELEPHONES. L. G. Hammer. 29,036. December 17th.

1913.

MEANS FOR COLLECTIVELY ACTUATING AND CONTROLLING ALTERNATING-CURRENT MOTORS. J. L. Routin. 735. January 9th.

METHODS AND APPARATUS FOR PRODUCING ELONGATED ELECTRIC ARCS. F. H. A. Wielgolaski. 2,165. January 27th.

METHOD AND APPARATUS FOR THE PRODUCTION OF ELONGATED ELECTRIC ARCS FOR THE TREATMENT OF GASES. F. H. A. Wielgolaski. 2,214. January 27th.

ELECTRICAL ADVERTISING SIGNS, DEVICES OR THE LIKE. L. Martin and G. Nixey. 3,562. February 11th.

DEVICES FOR PACKING EGGS, INCANDESCENT LAMP BULBS AND OTHER BREAKABLE ARTICLES. J. B. Warren. 3,591. February 11th.

ELECTRICALLY HEATED APPARATUS. E. C. R. Marks. (Landers, Frary & Clark.) March 3rd.

PROTECTIVE DEVICES FOR ELECTRIC CIRCUITS. E. E. F. Creighton. 5,662. March 6th. (May 2nd, 1912.)

ARC LIGHT ELECTRODES. Geb. Siemens & Co. 7,108. March 25th. (March 28th, 1912.)

NUMBER IMPULSE INSTRUMENTS FOR AUTOMATIC TELEPHONE SYSTEMS. Siemens and Halske Akt.-Ges. 7,630. March 31st. (March 29th, 1912.)

ELECTRIC CONDUITS. F. S. Rippingille and F. L. Broughton. 7,931. April 4th.

ELECTRIC SWITCHES. Voigt & Haeffner Akt.-Ges. 8,409. April 9th. (July 8th, 1912.)

ELECTROLYTIC ELECTRICITY METERS. Schott & Gen. 10,512. May 5th. (June 10th, 1912; Addition to 14,288, 1909.)

CONTROLLERS FOR ELECTRIC MOTORS AND LIKE APPARATUS. G. Ellison and M. H. R. Mueller. 12,882. June 4th. (Divided application on 22,959, October 8th, 1913.)

APPARATUS FOR COVERING THE SILVERING OF GLASS BY THE GALVANIC DEPOSITION OF A PROTECTING METAL. J. J. Declere, A. L. E. Gresy and G. Pascalis. 13,109. (June 27th, 1912.)

SUBMARINE ELECTRIC LEAKAGE TELEGRAPHY. Signal Ges. 13,919. June 16th. (June 5th, 1912.)

ELECTRIC TRANSFORMER FURNACE. J. Bally. 16,011. June 11th. (July 12th, 1912.)

SWITCHES OF THE TUMBLER KIND. W. J. Charles. 16,151. July 14th. (Divided application on 22,477, 1912. April 3rd, 1913.)

Metropolitan Association of Electric Tramways Managers.—A meeting of the members of the above Association was held on Friday, the 31st ult., at the Municipal and County Club, Whitehall Court, Whitehall, S.W., when the following were present:—Messrs. Ullmann (East Ham), Bruce (L.C.C.), Coveney (Erith), Schofield (Leyton), Harvey (Ilford), Moffet (West Ham), Hammond (Metropolitan Electric), Mason (South Metropolitan), and Goodyer (Croydon), hon. secretary. Letters of inability to attend were received from Messrs. Fell (L.C.C.), Stokes (Bexley) and Bruce (Dartford). Messrs. Ullmann and Coveney were re-elected chairman and vice-chairman respectively, and Mr. Goodyer was re-elected hon. secretary.